POPULAR
Computing WEEKLY

7 October 1982 Vol 1 No 25

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COMPUTER SWAP
SEE PAGE 24

Vic20 Adventure games tested

Spectrum ellipse

Boxing clever on ZX81

Machine code

Cover Story:
Laserchase on Spectrum
by Simon Lane

Win a Jupiter Ace in our Better than Basic competition

POPULAR Computing WEEKLY

The Team

Editor
Brendon Gore

Reporter
David Kelly [01-930 3271]

Sub-editor
Ninette Sharp

Editorial Secretary
Theresa Lacy

Advertisement Manager
David Lake [01-839 2846]

Advertisement Executive
Alastair Macintosh [01-930 3840]

Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

Popular Computing Weekly,
Hobhouse Court, 19 Whitcomb Street,
London WC2
Telephone: **01-839 6835**

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How to submit articles
Articles which are submitted for publication should not be more than 1000 words long.

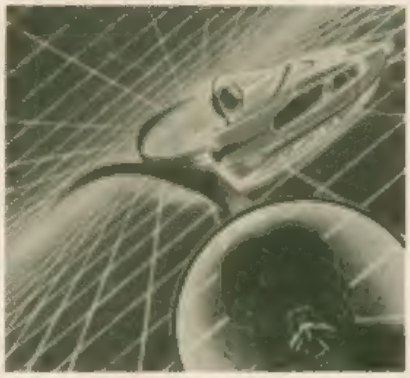
All submissions should be typed and a double space should be left between each line.

Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week



Cover illustration by Stuart Hughes

Editorial

Sinclair's decision to redesign the Spectrum's printed circuit board is not altogether surprising, in view of the production troubles which have plagued the Spectrum since its launch in April this year.

What is surprising is Sinclair's failure to announce that it had redesigned the Spectrum pcb.

A whole host of companies have grown up around the ZX80/81 and now the Spectrum. They have provided hardware and software support that Sinclair either could not, or would not, supply. These companies have played no small part in establishing Sinclair as the No 1 micro manufacturer in the UK.

Some of these companies, such as DK'tronics, Downsway and East London Robotics, have produced Ram expansion boards to enable 16K Spectrum owners to upgrade their machines to 48K. These expansion boards are not compatible with the redesigned pcb.

It would have been politic for Sinclair to let both his customers and the rest of the industry know what was happening. They found out soon enough anyway.

Next Week

Can you blast your way through a meteor storm? Find out in Asteroids — a new game for ZX Spectrum.

C.P.S. GAMES

ADVENTURES

SPECTRUM AND ATARI

HASHA THE THIEF

Try to enter the Potala and steal the golden teapot of the Dalai Lama. There are not only traps and pitfalls but even some magic trying to stop you from getting to the private rooms.

THE WIZARD OF SHAM

If you can reach his hide-out, then he will give you the elixir of life. Travel through the jungle, the ghost town of Sham and find the secret entrance to the temple in which the wizard hides. Once in the temple you will need all your skills and determination to avoid the dangers awaiting you. You may meet the wizard in the end, but we doubt it . . .

THE FOURTH KIND

Can you manage to communicate with the extra-terrestrials and obtain from them the universal medicine for eternal life? This is not only an adventure but will test also your skills in trying to overcome what would seem to be impossible communication problems.

THE 7 CITIES OF CIBOLA

These famous cities, where the Spanish Jesuites found their gold, are situated somewhere in the South-American jungle. Their whereabouts have been lost for several centuries, and nobody has found them ever since. Can you survive in this exhausting climate and find at least some treasure? And, if you find it, will you still be strong enough to get back with your gold? There is not only the climate; indians, poisonous animals, secret religious sects and many more.

THE DOMED CITY

You are travelling through unmapped territory and your way is blocked by a giant ant heap. By a freak mutation these ants are as big as you and there is only one way open: through the ant's lair. Some ants are friendly, others are aggressive, and your weapons are not much help: your survival depends on skill, anticipation and cunning. Will you succeed?

THE TOWER OF BRASHT

One member of your expedition has been taken prisoner by the Khans, a cruel tribe living near the edge of civilisation. You must choose a few companions from your team, and try to get the prisoner out. Success or failure will depend on whom you choose and how they are equipped. This D&D type adventure is difficult and will take you some time to play. It can be used as a roleplaying adventure, with as many players as there can be members of the team.

THE GHOST OF RADUN

In the old, half ruined castle of Radun, a large treasure is buried. Many have tried to find it, but none have ever returned to tell the tale. It is rumoured that the treasure is guarded by a ghost, who appears when least expected, and makes sure that the treasure hunter can no longer return. This adventure is definitely not for the weak-hearted and we strongly advise not to play it after nightfall, especially not when you are alone in the house.

ADVENTURES FOR THE VERY YOUNG:

There is no longer any need for very young children to gaze wistfully at a computer they are not allowed to touch.

This new series of adventures is mainly based on graphics, but follows the traditional pattern of an adventure game. There are some elementary instructions for which a bit of help from the grown ups may be needed. If you want to see some little eyes light up . . .

PETER RABBIT AND THE MAGIC CARROT

Peter Rabbit goes on a quest for the magic carrot. It is rumoured that any rabbit taking one bite of that carrot gets an extra twenty years of life.

Peter has to go through the big forest, meets nice (and not so nice) friends, deals with a dwarf, gets help from old man oak, etc . . .

Will he get to the cave and find the magic carrot?

PETER RABBIT AND FATHER WILLOW

Father Willow has been damaged by vandals, and is now in a bit of a state. Peter Rabbit goes in pursuit of the vandals. They know and try not only to escape but to stop Peter Rabbit from following them. Luckily the latter gets help from the other trees, who heard about the story. But will he find the vandals and have them locked up?

PETER RABBIT AND THE NAUGHTY OWL

Jimmy the Owl has been unsufferable of late. The Council of the Meadows sends Peter Rabbit on an expedition to find the Master of the Owls, in order to have Jimmy taught some manners. The Master lives very far away and its quite an adventure getting there. Will Peter Rabbit come back without having seen the Master and thus Jimmy remain a nuisance?

It now transpires that the Peter Rabbit Adventures can be dangerously addictive to grown ups . . .

TUMMY DIGS

Complementing the Peter Rabbit series, a new series on Tummy Digs, a little dwarf. As with the Peter Rabbit games, the adventures are very easy (basically a maze) with graphics and it is up to the kids to invent the story themselves, after an introduction has been given.

TUMMY DIGS GOES SHOPPING

Make a shopping list, walk out of the forest and shop in town. You must find the shops, pay for your purchases and make sure that you can carry it all. Also, don't run out of money . . .

TUMMY DIGS GOES WALKING IN THE FOREST

Have a pleasant but adventurous walk in the forest. Meet some animals and plants, have a chat, and make sure you are home in time for bath and dinner.

WAR GAMES

All with full graphics of the battle field, and inclusive of manual.

KING ARTHUR

Britain in the sixth century . . . THE ANGLES AND SAXONS are marauding through the Country, leaving behind a trail of blood and devastation. In the South a man is gathering troops and fitting them out. His name is Arthur. You take his role in this fascinating wargame. Will you be able to win all the battles he won and free Britain from the plundering marauders? How good are you at commanding troops, finding the enemy and bring him to battle, sifting information, seeing through the fog of war, deploying your troops and many more similar skills?

BATTLE OF THE BULGE

Ardennes, 1944. The famous "von Rundstedt" offensive.

BATTLE OF THE RIVER PLATE

A simulation of this well known sea battle.

CONVOY

You are the commodore of a convoy under attack from submarines. Instant decisions are required and if you hesitate too long the damage might be worse. Try and locate the enemy and destroy him. Not easy . . . Again graphics, but combined with verbal information.

All these games are available for ATARI 16K and SPECTRUM 16K
Some of the games will load different programs successively and are thus much larger than 16K.
All C.P.S. Games, except those for children, are priced at £9.50. The Peter Rabbit and Tummy Digs games are now £4.50.

C.P.S. 14 Britton St., London EC1M 5NQ (01-251 3090)

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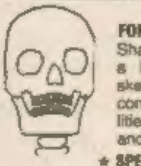
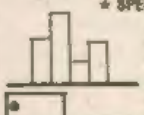


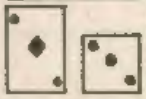
FOR SPECTRUM
Hi Res Graphics Plotting Pad. Full 256+176 pixel resolution. Semi-transparent to aid copying. Supplied with pixel ruler and full instructions — **£2.90** (50-sheet pad)

FOR SPECTRUM AND BBC (32K)
Shape — a shape drawing routine with a library of shapes — including skeleton; provides the ability to easily construct your own designs. Many facilities including expand, rotate, mirror and shift. Full instructions — **£4.50.**

★ **SPECIAL OFFER — GRAPHICS PAD + SHAPE PACKAGE — £6.90** ★



FOR SPECTRUM
Chart draw — chart and graph drawing package. Draws pie charts, bar charts and graphs. Provides auto scale labelling and division. Full instructions — **£5.00.**



FOR SPECTRUM AND BBC
Compendium of Card and Dice Games, includes Snap — with snapability rating. Superb graphics. Dice allows you to pit your wits against the computer — **£4.00.**

★ Coming soon – for Spectrum and BBC. The Skeleton – Guess a Bone Game!
★ Wanted – Spectrum Games. High royalties paid.

Please make cheques payable to Keyboard and send to: 28 Forest View Road, Walthamstow, London E17 4EL

SOFTWARE IN ASSOCIATION WITH INTELLIGENCE (GB) LTD.

Spectrum plugs in new sockets

SOME memory expansion adds-on already being manufactured for the ZX Spectrum are no longer compatible with machines now being sent out.

In order to solve some of the production difficulties which have plagued the Sinclair machine since its launch, the main printed-circuit board has now been redesigned. The main feature is the incorporation of the Ram expansion sockets into the main board, rather than as a plug-in auxiliary board.

This change has caused problems for those companies who already manufacture Spectrum Ram expansion boards, since their products are no longer compatible. The three companies concerned are East London Robotics, DK'tronics and Downsway.

All three plan to adapt and produce two types of Ram expansion kits.

Mark Vellacott of East London Robotics said that his company would continue to produce its present 32K and 64K plug-in boards for £32 and £50. However, he is now also selling both sizes of up-grade suitable for use with the new boards. The new 32K version now consists of just the 12 memory chips which plug directly into the new boards and costs £25. The 64K expansion now bolts on rather than plugging in and will still cost £50.

A spokeswoman for DK'tronics admitted: "The new board caused a few hiccups here — because we were'nt at first aware of it — but we shall just change our design."

Downsway's Martin Dare said that he was aware of the Spectrum design change. "As soon as we can get hold of one of the new machines," he said, "we shall be able to produce a modified version of our Ram expansion but, like so many others, we still have machines on order. Our present 32K expansion costs £42.50 and we hope the new one will be even cheaper."

Machines with the new and old boards can be distinguished, without taking them apart, by looking at the expansion ports. The conducting strips on the printed-circuit, visible at the port, were about the same width as the gaps between them in the original. The gaps on the new pcb are much narrower than the conducting strips.

More than 45,000 visitors attended the fifth Personal Computer World Show, held in the Barbican Centre Exhibition Halls from September 9 to 12. See show report, page 11.

Crawley IT exhibition

CRAWLEY Information Technology Exhibition takes place on October 13 to 16.

It will feature more than 30 stands. Admission is free. On Wednesday the emphasis will be on schools and on the educational aspects of microcomputers. Thursday and Friday will concentrate on business users and Saturday will be aimed at the home user and games player.

On Wednesday and Saturday the exhibition will be open from 9.30 am to 5 pm; Thursday until 8.30 pm.

The IT show will be held at Crawley College, College Road, Crawley. For further information contact Robin Green on Crawley 25686.

Self-financing move by IT centres

A high-resolution graphics board for the ZX81 has been launched by the country's Information Technology Centres in a move to make them partly self-financing.

The boards, for use with the 16K ZX81, will cost £27.50 and will be designed and built by the IT centres at Notting Dale in London, and at Telford.

It is hoped that up to 100 IT centres will be set up, financed in part by £30m from the Manpower Services Commission and the Department of Industry. The remainder of their running costs has to be found by the IT centres themselves.

Dragon breathes fire into software market

METTOY has followed up the launch of its Dragon-32 microcomputer with a range of software cartridges and cassettes.

It is now offering seven new games cartridges and a selection of games and utility cassettes. The cartridges are *Berserk, Meteoroids, Cosmic Invaders, Ghost Attack, Cave Hunter, Starship Chameleon* and *Astroblast*. They all cost £19.95 except *Ghost Attack* which is £24.95.

The cassettes are a *Compendium of Games*, a *Compendium of Applications*, five adventure games — including *Dragon Mountain, Madness and the Minotaur* and *Quest* — a *Personal Finance Package*, a *Graphic Animator*, a *Computer Voice* and a maze game, *Flag*. All the cassettes cost £7.95.

Andy Redman, Dragon Data's Software Development Manager, said: "We are obviously looking to get into the domestic and educational software markets. We think the market is as much to do with the software as the hardware — but you cannot sell the petrol until you have sold the car!

"Now that the Dragon-32 is selling so well we are stepping up the software development side of the company. Not only that — when we get the disc drives for the Dragon its potential for software will be increased enormously."

Timex Challenger.

Space attack held at arm's length

NOW you need never be separated from the world of the video game.

Timex now offers a wrist watch, The Challenger, that plays a version of *Missile Attack*.

The object of the game is to pilot your space-craft across the screen to the safety of the mothercraft, whilst avoiding the succession of enemy missiles which are trying to annihilate you at every opportunity.

As well as enabling you to fight an avalanche of missiles accompanied by simulated firing noises, the instrument tells the time. Its liquid-crystal display also functions as a 24-hour chronograph.

The Challenger is available from most Timex stockists, price £19.95.

ZX81 software price cuts

IN what could be just the start of a price-cutting avalanche Quicksilva has dropped the price of its best-selling ZX81 software.

The cost of its *Asteroids* and *Scramble* programs has been cut from £5.50 to £4.95.

Quicksilva's Mark Eyles said: "We have cut the costs of the cassettes to keep the ZX81 market going. There was certainly a lull in software sales after the Spectrum launch so these price drops should make it a bit more healthy."

Letters

write to Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2

A Sassenach's error

May I take you to task. I can forgive errors in programs. It is interesting to put them right.

But, glancing through *PCW* July 8, I saw an article entitled "Up among the highlands". Good. I thought, but no — another clanger. Please note Edinburgh is not in the highlands.

E Miller
15 Elmgrove
Achareidh
Nairn
Scotland

Spectrum's secret passageways

I have had my Spectrum for a month and I have begun to look deeper at one or two of its secrets.

One point which may be of interest is that over 1K of the 15K Rom apparently has nothing in it. To be precise, addresses 14446 to 15615 contain FF-HEX (the character set starts at 15616).

That means that 1169 bytes are unused. If that is the case, why could Sinclair not provide us with a Renumber routine, or additional commands such as *If — Then — Else* and *Repeat — Until*.

David Poole
28 Cuttys Lane
Stevenage
Hertfordshire SG1 1UN

Soft landing on Jupiter

It did not seem possible to soft-land on Jupiter in the Voyager program (*PCW* July 22). The additional procedure below allows this fairly easily, but although any key will relaunch, only one allows much chance of getting away. The additional slight changes limit mission time and add a few more velocity restraints; but why does one sometimes go into outer space when attempting to get off Jupiter — unintended, can anyone explain?

```
1640 DEF PROCsoft-land
1650 UI%=0:UJ%=1
1660 VDU28,0,3,19,1:PRINT
     "Welcome to Jupiter","Lift off
     for Saturn":VDU28,0,31,31,39,
     ■
1670 XS%=XS%+70:YS%=YS%
     +70
1680 Z=GET:DRAWXS%,YS%:B%
     =POINT(XS%,YS%)
1690 UJ%=10:UI%=-0:SOUND
     0,-15,7,10
1700 ENDPROC
Other changes:
 105 TIME=0
 110 REPEAT
 120 PROCnew-coordis
 130 UNTIL(B%<>0 AND
     B%<>3)ORABS
     ((UI%+UJ%/10)*UJ%)
     >30ORTIME>6000
 135 IF B%=1 AND ABS(UI%*UJ%)
     <5 THEN PROCsoft-land ELSE
     140
 136 GOTO 110
 140 IFB%=-1 THEN PROCmissed
     ELSE 150
 145 GOTO 180
 150 IFB%=2 THEN PROCland
     ELSE 160
 155 GOTO 180
 160 IFB%=1 THEN PROCjupiter
     ELSE 170
 165 GOTO 180
 170 IF ABS(UI%+UJ%/10)*UJ%)
     >30 THEN PROCoverdrive
     ELSE 175
 172 GOTO180
 175 VDU26:PRINT TAB(5,5);
     "WHERE ARE YOU ?"
 300 N=.6E16 (otherwise you never
     get off Jupiter)
 940 SOUND0,-15,7,10 (the motors
     go off after a time on Jupiter)
1060 SOUND17,0,(UI%+UJ%/10)
     *UJ%+10,255
1065 SOUND0,-15,7,10
1320 VDU26
Delete 1330
1260 VDU 26
Delete 1270
```

J H Powell
49 Meadowhead
Sheffield
South Yorkshire

One man's meat is another's poison

Being an ex-owner of an Atari Videopac computer system — due to the extortionate cost of its cassette games — I am dismayed at the news that Atari is taking action against software companies who are producing games similar to its own.

I am now a proud owner of a BBC model B and wish to purchase a *Pacman* game for it. But if Atari (who, on past experience, appear just to be interested in making as much profit as possible) goes through with its threats, there will be no chance for me to buy this program.

Of course, I could go and stand in a queue for the machine at the pub, but that is not my idea of a good night out.

PS The Saturn program was great.

Claire Hallworth
Charlston
Shay Lane
Halebarns
Altrincham
Cheshire

Speeding up screen clearing

I am 14 years old and the proud owner of a ZX81. I am part way through designing a "3D Lunar Lander" game which includes the use of the *Scroll* function. All very well, but a problem came when clearing the screen after *Scrolling*. I found out, as I know many other ZX-users have, that it can take up to 25 seconds to clear the screen after the *Scroll* function has been used. I found out that if *Poke* 16389,76 was added at line 1 of the program the problem was solved — the screen cleared instantly when told to do so. For example, try this short program:

```
Lines
1 POKE 16389,76
10 PRINT AT 21,RND*31;"*"
20 SCROLL
30 IF INKEY$="9" THEN GOTO 50
40 GOTO 10
50 CLS
```

After a few seconds of *Scrolling*, press the "9" key and watch carefully to see how fast the screen clears. Another advantage is that it speeds up character movement on-screen. For example, type in this routine:

```
Lines
1 POKE 16389,76
10 FOR F=0 TO 30
20 PRINT AT 10,F;"(space)*"
30 NEXT F
```

Fast, isn't it?

One more thing, this command is not affected by *New*. Deleting it from your program will not have any effect once the program has been *run*. To erase it from your memory you will have to take the drastic step of disconnecting the lead from your computer.

I hope these hints have been of value to all you ZX81 owners.

Simon Brewer
55 Scott Avenue
Baxenden
Accrington
Lancashire BB5 2XA

An abundance of errors

I was very interested to read the letter by Ian Logan in your latest issue *(Popular Computing Weekly*, September 9) regarding bugs in the Spectrum Rom. I have discovered two more — it thinks that *Int*-65535.5=-1E-38 and *Input* statements do not actually require any variables. As an example, enter:

```
10 INPUT "This is a bug"
20 GOTO 10
```

There are also a lot of misprints in the manual. On page 152, exercise 1, the *Sin* program mentioned is in chapter 17, not 19, and on page 170, negative numbers are represented by the number +65536, not 131072.

The program on page 176 works fine on the ZX81, but for the Spectrum line 20 should be *Print Peek (Peek* 23627+256+*Peek* 23628+n) in the first example and *Print Peek (Peek* 23635+256#*Peek* 23636+n) in the second. On page 184, Chr$47 is actually "\", not "/", and on page 202 the command *Delete* "filename" is mentioned, despite the fact that it does not exist.

Both the Rom and the manual were written by Steve Vickers, so lets hope the Rom in his new Jupiter Ace has fewer bugs (even his photo on page 13 of your magazine was printed backwards).

As a final point, on Peek and Poke in the same issue, you say that the Microdrive routines are contained in the Spectrum Rom. They are not, only the facility for them is there. There is a 2K unused sector in the Rom, so this is where the routines are likely to go, in a new Rom supplied with the Microdrive, hopefully bug-free.

Andrew Pennell
14 Sweyn Road
Cliftonville
Kent

Mea Culpa. The photograph of Steve Vickers was reversed, though it takes a keen eye to spot it.

You are also correct in saying that the Microdrive routines are not contained in the Spectrum Rom, just the potential for their inclusion. We expect the Microdrive, when it finally appears, will contain its own Rom.

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2.

COVER STORY

Laser Chase

A new game for 16K Spectrum
by Simon Lane

You were designed for the Laser Chase. That is your purpose, your life, your future.

It is 2047. You have been genetically synthesised as a player in the game. And that is all. All there is. The game.

Only earth members, Stratum 1 can watch you as you win or die. Other orders are prohibited. But you can be sure that all those who can will be there. The holograscope auditoriums are certain to be packed.

As an android you have been brilliantly designed. The emotions you have been allowed are sufficient to make you want to win. To not die. And go forward to the next Laser Chase.

All that you can concieve, all that you can ever be aware of, is contained within The Pen.

Inside The Pen there is only you and your adversary. When the Laser Chase begins you have been conditioned to move. There is no choice. Life for the Chaser Android is compressed to five decisions only: four directions and a choice of speeds. As you move a genetically constructed wall is cultivated in your wake — and this construction drains your energy and saps your life material.

To win is to play again. You win by forcing your opponent to strike either your wall or the perimeter of The Pen. Both are secreted with a deadly poison which unravells your central nervous system.

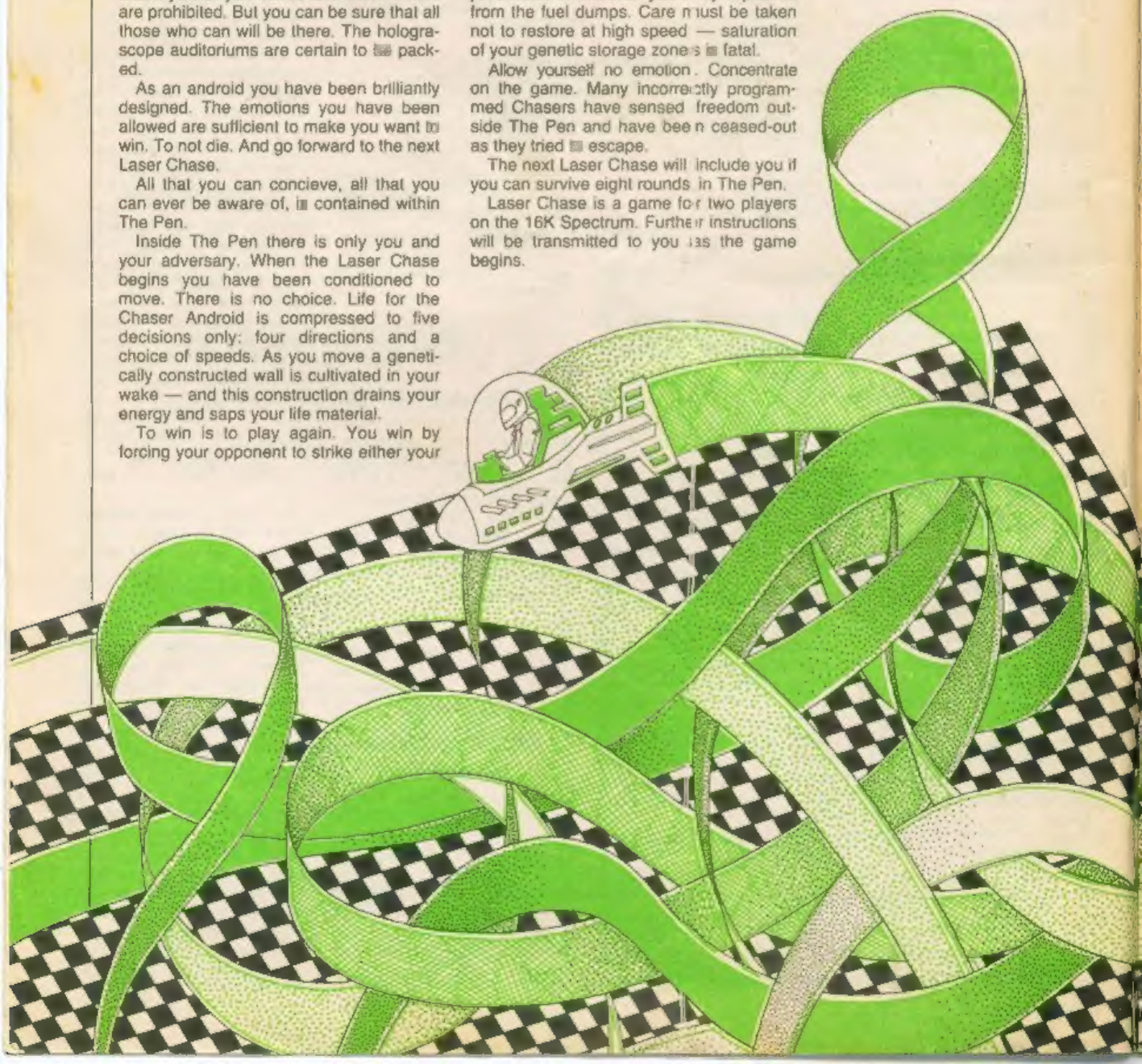
If you collide with the rival android's wall or the sides of The Pen you loose one of your eight lives.

As your life banks become drained by production of the wall you may replenish from the fuel dumps. Care must be taken not to restore at high speed — saturation of your genetic storage zones is fatal.

Allow yourself no emotion. Concentrate on the game. Many incorrectly programmed Chasers have sensed freedom outside The Pen and have been ceased-out as they tried to escape.

The next Laser Chase will include you if you can survive eight rounds in The Pen.

Laser Chase is a game for two players on the 16K Spectrum. Further instructions will be transmitted to you as the game begins.



```
  10 REM Laser Chase
  20 REM © Simon Lane, 1982
  25 REM ------------------
  30 RANDOMIZE : FLASH 0: OVER 0
  40 INVERSE 0: BRIGHT 0: INK 7
  50 BORDER 0: PAPER 0: CLS
  55 RESTORE 9000
  60 FOR i=0 TO 7: READ n: POKE
USR "a"+i,n: POKE USR "c"+7-i,n:
 NEXT i
  70 FOR i=0 TO 7: READ n: POKE
USR "b"+i,n: NEXT i
  80 FOR i=0 TO 23: READ n: POKE
 USR "d"+i,n: NEXT i
  90 FOR i=0 TO 7: READ n: POKE
USR "g"+i,n: POKE USR "h"+7-i,n:
 NEXT i
 100 FOR i=0 TO 7: READ n: POKE
USR "j"+i,n: POKE USR "l"+7-i,n:
 NEXT i
 102 FOR i=0 TO 7: READ n: POKE
USR "k"+i,n: NEXT i
 105 DIM l$(4,4): FOR i=1 TO 4:
FOR j=1 TO 4: READ n: LET l$(i,j
)=CHR$ n: NEXT j: NEXT i: LET c=
1
 110 GO SUB 6000
 120 PRINT '" Each player must
drive his ""laser chaser around
the grid ""without hitting a las
er wall or ""the other player. C
ollect extra"
 130 PRINT "fuel (";INK 6;FLAS
H 1;CHR$ 154;" FLASH 0;" INK 7;")
by colding with it at ""slow sp
eed to avoid explosion."
 140 INPUT '" ENTER to continue.
";LINE a$
 150 CLS : GO SUB 6000
 160 PRINT '" Controls are: Up
Dn Lt Rt Fast"
 170 PRINT '"Player 1 (";INK 1;
PAPER 7;CHR$ 149;CHR$ 149;CHR$
145;" PAPER 0;" INK 7;"): A O E
R 3"
 180 PRINT "Player 2 (";INK 2;
PAPER 7;CHR$ 149;CHR$ 149;CHR$ 1
46;" PAPER 0;" INK 7;"): 0 L O
P 9"
 190 PRINT '" The first to scor
e 6 wins."
 200 INPUT " ENTER to start.";
LINE a$
 210 DIM s(2): DIM x(2): DIM y(2
): DIM f(2): DIM d(2): DIM v(2):
 DIM o(2)
 220 PAPER 7: CLS
 230 PRINT PAPER 1;" PLAYER Scor
e:";s(1);" "; PAPER 2;" PLAYER S
core:";s(2);" "
 240 PRINT PAPER 1;" ONE Fuel:
   "; PAPER 2;" TWO Fuel:
  "
 250 LET f(1)=f(1)+500: LET f(2)
=f(2)+500
 260 LET f=1
 265 LET a=1
 270 LET d(1)=1: LET d(2)=1
 280 LET x(1)=21: LET y(1)=8
 290 LET x(2)=21: LET y(2)=31
 295 LET o(1)=1: LET o(2)=1
 300 FOR i=1 TO 2: PAPER 8: PRIN
T AT 1,i*16-5;"000"( TO 4-LEN ST
R$ f(i));f(i);" PAPER 7;" PRINT IN
K i;AT x(i),y(i);CHR$ (143+d(i))
: NEXT i
 310 IF f(1)=0 OR f(2)=0 OR (x(1
)=x(2) AND y(1)=y(2)) THEN GO TO
 2000
 330 IF f THEN FOR i=1 TO 0 STE
P -1: FOR j=24 TO 12 STEP -2: BE
EP 0.01,i+j: NEXT j: NEXT i: FOR
 i=12 TO 36 STEP 2: BEEP 0.01,i:
 NEXT i: LET f=0
 340 LET x$=("3" AND (IN 63486=2
47 OR IN 63486=243))+("2" AND IN
 64510=247)+("3" AND (IN 65022=25
1)+("4" AND IN 64510=251)
 350 IF LEN x$=1 THEN LET d(1)=U
AL x$
 360 LET x$=("1" AND (IN 61438=2
54 OR IN 61438=252))+("2" AND IN
 57342=254)+("3" AND (IN 49150=25
3)+("4" AND IN 57342=253)
 370 IF LEN x$=1 THEN LET d(2)=U
AL x$
 380 LET v(1)=IN 63486=251 OR IN
 63486=243
 390 LET v(2)=IN 61438=253 OR IN
 61438=252
 400 FOR i=1 TO 2: LET x=x(i): L
ET y=y(i): IF v(i) THEN BEEP .01
,i*2+40: BEEP .01,i*2+41: GO TO
420
 410 IF NOT a THEN FOR z=i*2+30
TO i*2+38 STEP 2: BEEP .01,z: NE
XT z: GO TO 1000
 420 LET x(i)=x(i)+(d(i)=3)-(d(i
)=1): LET y(i)=y(i)+(d(i)=2)-(d(
i)=4)
 430 IF x(i)>21 OR x(i)<2 OR y(i
)>31 OR y(i)<8 THEN LET x(i)=x:
LET y(i)=y: LET f(i)=0: GO TO 60
0
 440 IF ATTR (x(i),y(i))=57 OR A
TTR (x(i),y(i))=58 THEN LET f(i)
=0: GO TO 600
 450 IF ATTR (x(i),y(i))<>134 TH
EN GO TO 600
 460 IF NOT v(i) THEN LET f(i)=f
(i)+250: GO TO 600
 470 LET f(i)=0
 600 PRINT AT x,y; INK i;l$(o(i)
,d(i))
 610 LET o(i)=d(i)
1000 LET f(i)=f(i)-2-v(i)*2: IF
f(i)<0 THEN LET f(i)=0
1010 NEXT i: LET a=1-a
1020 IF RND>.025 THEN GO TO 300
1030 LET x=INT (RND*20+2): LET y
=INT (RND*32): IF SCREEN$ (x,y)<
>" " THEN GO TO 1030
1040 PRINT AT x,y; FLASH 1; INK
6; PAPER 0;CHR$ 154: GO TO 300
2000 IF x(1)=x(2) AND y(1)=y(2)
THEN GO TO 2500
2010 FOR i=1 TO 2: IF f(i)>0 THE
N GO TO 2400
2020 PRINT AT 1,i*16-5; FLASH 1;
 PAPER i;"0000"
2030 FOR j=1 TO 40
2040 PRINT AT x(i),y(i); INK i;C
HR$ (143+d(i))
2050 BEEP .05/j,50
2060 PRINT AT x(i),y(i);" "
2070 BEEP .05/(41-j),46
2080 NEXT j
2090 LET s(3-i)=s(3-i)+1
2400 NEXT i
2410 GO TO 3000
2500 LET a=1
2505 FOR j=1 TO 40
2510 PRINT AT x(1),y(1); INK a;C
HR$ (143+d(a))
2520 BEEP .05/j,50
2530 PRINT AT x(1),y(1);" "
2540 BEEP .05/(41-j),46
2550 LET a=3-a: NEXT j
2560 LET s(1)=s(1)+1
2570 LET s(2)=s(2)+1
2580 LET f(1)=0: LET f(2)=0
3000 IF s(1)<8 AND s(2)<8 THEN G
O TO 220
3010 PRINT AT 0,14; FLASH 1; PAP
ER 1;s(1);AT 0,30; PAPER 2;s(2)
3020 FOR i=0 TO 46: BEEP .01,i:
BEEP .01,48-i: NEXT i
3030 PAPER 0: CLS : GO SUB 6000
3040 IF s(1)>s(2) THEN PRINT '''
    PLAYER ONE IS THE WINNER!"
3050 IF s(2)>s(1) THEN PRINT '''
    PLAYER TWO IS THE WINNER!"
3060 IF s(2)=s(1) THEN PRINT ''T
AB 9;"IT IS A DRAW!"
3070 INPUT "Another go (y/n)? ";
 LINE a$
3080 IF a$="" THEN STOP
3090 IF a$(1)="y" OR a$(1)="Y" T
HEN RUN
5999 STOP
6000 RESTORE
6005 INK c
6010 READ x,y: PLOT x,y+35
6020 READ x: BEEP .01,RND*48
6030 IF x=-1 THEN GO TO 6100
6040 IF x=999 THEN GO TO 6010
6050 READ a: DRAW x,y: GO TO 602
0
6100 PRINT AT 14,9;"by Simon Lan
e"
6110 INK 7
6120 LET c=c+1
6130 RETURN
7000 DATA 1,139,0,-48,48,0,999
7010 DATA 52,91,24,45,24,-48,999
7020 DATA 64,116,24,0,999
7030 DATA 151,139,-48,0,0,-24,48
,0,0,-24,-48,0,999
7040 DATA 202,139,-48,0,0,-48,48
,0,999
7050 DATA 154,115,48,0,999
7060 DATA 205,91,0,45,48,0,0,-24
,-45,0,999
7070 DATA 229,115,24,-24,999
7080 DATA 49,81,-48,0,0,-48,48,0
,999
7090 DATA 52,81,0,-48,999
7100 DATA 52,57,48,0,999
7110 DATA 100,81,0,-48,999
7120 DATA 103,33,24,46,24,-48,99
9
7130 DATA 115,57,24,0,999
7140 DATA 202,81,-48,0,0,-24,48,
0,0,-24,-48,0,999
7150 DATA 253,81,-48,0,0,-48,48,
0,999
7160 DATA 205,57,48,0,-1
8000 DATA 24,24,60,60,126,126,10
2,66
8010 DATA 0,240,124,63,63,124,24
0,0
8020 DATA 0,15,62,252,252,62,15,
0
8030 DATA 66,66,66,90,90,66,66,6
6
8040 DATA 0,255,0,24,24,0,255,0
8050 DATA 66,67,64,66,66,64,127,
0
8060 DATA 66,194,2,26,26,2,254,0
8070 DATA 24,36,102,153,153,102,
36,24
9000 DATA 148,151,148,152
9010 DATA 153,149,152,148
9020 DATA 148,150,148,155
9030 DATA 150,149,151,149
```

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PCW4

Barbican and Bingley show their wares

***David Kelly** reports on the Personal Computer World and Microscene shows*

Like a whirlwind the 5th *Personal Computer World* show has come and gone. According to an independent survey conducted by the organisers, over 45,500 people attended the giant exhibition spread over four days from September 9 to 12.

It was one of the first events to be staged at the new purpose built Barbican Centre exhibition halls — and pretty claustrophobic it was too. On the upper floor the ceiling was within easy reach and, despite the fact that the air-conditioning was going full blast, the temperature soared.

Still, if you could put up with the free sauna and were prepared to push your way through the crowds, there was plenty to see.

All the major companies were represented. Some — like Atari and Commodore — displayed their range with a flare bordering on the overdone. Rotating plinths and back-lit screens sell microcomputers.

Sadly, however, many of the smaller home micro companies did not attend — probably because of cost. Stands were charged at £92 per square metre, with the minimum size costing over £450.

Several new machines made their first public appearances at the show. The Lynx, Jupiter Ace and Colour Genie were all on display and attracted a good deal of interest. It was also the first time Mettoy had exhibited the Dragon-32 and its stand drew big crowds. Attention was paid to the new Commodore 64, due to go on sale in the UK towards the end of September.

The show was also notable for its absentees. Neither the Acorn Electron nor the Sinclair Microdrives put in an appearance.

The Sinclair stand was besieged by customers waiting for their ZX Spectrums. Those working on the stand spent almost more time dealing with delivery enquiries than they did selling the machine or promoting the new range of Sinclair Spectrum software. They also advised waiting customers against buying non-Sinclair plug-in Ram boards — the Spectrum printed-circuit board is once again being modified.

Most software companies had new material — among them Artic, Bug-Byte, Quicksilva, Silversoft and JRS. Macronics displayed its new disc drive for the ZX81.

One or two American agents were seen at the show, trying to tie up deals to market and distribute software in the US for the Timex Sinclair 1000. This 2K version of the ZX81 went on sale through retail outlets in the US in September.

Between micro-enthusiasts the generation gap is a thing of the past.

The main drawback with the *Personal Computer World* show is its scale. Visiting all the stands would have been an impossible marathon. Also, since the stands ranged from selling purely business applications to selling micro games, some of the exhibitors found that only a small proportion of those visiting their stand were interested in their products.

Jenny Kin, the show's publicity manager, was however clearly delighted: "It has had the largest audience of any microcomputer show in the world. That is obviously a reflection of the strength of the industry in the UK.

"In 1981 we had 16,000 visitors. Now we have had over 45,000. The last five years has seen the show grow with the industry, and it will continue to do so. "As far as the exhibitors go, the cost of being at the *Personal Computer World* show is less than some others. You get what you pay for. You pay for the audience — and we spent a lot of money getting that audience in."

The next *Personal Computer World* show juggernaut is already at an advanced stage of planning. It will be held in September 1983, once again in the Barbican Centre.

Microscene Brum

Out of the hot-house atmosphere of the Barbican and up to the relative calm of Birmingham's Bingley Hall and Microscene Brum 82.

This show, on September 11, occupied only a small part of this vast draughty venue. The remaining three-quarters of the hall was left to form a spacious rest area.

Even though a large number of enthusiasts attended there was still plenty of room to get around and see what the 60 exhibitors had to offer.

The event had a strong ZX and educational flavour since its organiser, Eric Deeson, also runs EZUG, the Educational ZX Users Group. Several Spectrums and one Dragon-32 were on display, as was the Macronics ZX81 disc drive.

On the whole, those exhibitors with ZX81 material did well and those with Spectrum wares did not. One company, in the latter group, took less than £10 the whole day. This was because, for some reason, very few Spectrums have so far been delivered in the Birmingham area.

Most people however, exhibitors and visitors alike, rated the fair a success. Said Eric Deeson: "We expected a thousand people to turn up. We hoped for 2000 and we got 3500. We ran out of tickets at midday so, yes, it went very well."

Alleys at the Barbican.

An amalgam of Vic20 adventures

Reviews

Novice adventurer: *Mike Grace puts the bite on Dracula.*

Adventure games are claimed to be among the most popular games available for microcomputers. Having spent an exhausting weekend trying to escape the bite of the dreaded Dracula, exploring a Voodoo castle, racing against time to discover a timebomb ticking away in a nuclear plant, and several other equally amazing feats of daring, I can quite see why.

For those people who don't know exactly *what* an adventure game is, or have heard the term but never seen a game in action, I will attempt a brief explanation. Adventure games are really computerised versions of role playing games, the best known of which is *Dungeons and Dragons* (abbreviated to *D&D* by those in the know). Unlike games such as Monopoly, there is no board as such. Instead, the players assume the roles of various characters in a fantasy story, for example a wizard, dwarf, witch or princess.

The players then have to carry out certain tasks, usually rescuing someone or finding some treasure. At the same time, the players have to cope with sundry nasty attempts by evil magicians, dragons or powerful spirits to remove them from the game. To try and help the characters in their quest, they can acquire magic spells and useful weapons along the way.

The real essence of the game is the preparation of a plot, and a series of labyrinthine tunnels or rooms, the exact location of which are known only by the 'dungeonmaster'. Thus, to take an example, the game could start with the dungeonmaster telling his group that they are in the grounds of a castle. There is a door in the wall ahead of them, and a huge ogre pursuing them with a club in his hand to smash them to pulp.

One of the group tries to open the door in the castle wall. The dungeonmaster replies that it is locked. Another of the group reveals that he has a magic key (acquired earlier in the game) which he tries in the lock. The dungeonmaster explains that the key fits, but will not turn. And so the game progresses.

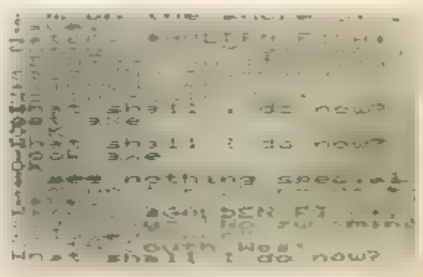
Over the last 10 years or so *D&D* has built up a cult following. With the advent of the microcomputer it was obvious that someone would transfer the game into the sphere of machine-code language. Perhaps the best known of adventure game writers is Scott Adams. Five of his adventures have now been transferred onto cartridges by Commodore for the Vic20, hence my exhausting weekend.

I had heard about Scott Adams, but had never seen a game in action. So it was as a relatively green player that I sat down to the first game in the series — *Adventure Land*.

The packaging was more attractive than most games I have seen, (a sleeping dragon looking as if it should be adorning the cover of Tolkien's *The Hobbit*). I inserted the cartridge into the slot in the back of my expansion unit, and switched on. The first problem, that it did not work, was soon solved by removing the extra 16K of Ram that I usually keep permanently in my expansion unit — it might have been helpful if Commodore had added that precaution to their instructions — and I typed *Sys* 32592 to start.

In an adventure game the computer takes on the role of the dungeonmaster (or organiser). There are no graphics at all in these adventures, a feature I thought might spoil the game, but I can safely say that the fascination of trying to outwit the adventure more than compensates for the lack of pictures. In fact I was hooked almost instantly into the style of the game and quickly began to appreciate its versatility compared with the *Pacman/Space Invaders* type.

Having inserted the cartridge and keyed in the *Sys* command, the computer asks first if you want to restore a previous game. One of the features of these cartridges is that they allow you to save a game part-way through and then load it back from the tape so that you can start where you left off. This is very valuable as the more skilled you become the longer it takes to try and solve the puzzle. (I should point out that I have not yet managed to solve any of the Commodore adventures completely).



I typed in *No* and up came the welcome note plus the instructions (in green to help clarify your situation) that I was in a forest with trees, and the words North, South, East, West. This was followed by the instruction "What shall I do now?" I gazed at the screen, perplexed for a moment, and returned to the instruction manual.

One of the notes of advice was to use instructions to the computer of two words only, with words like *Climb, Drop, Enter, Examine* and *Take* ■ give the Vic a command. I also discovered that if I typed *N* for *Go North* or *S* for *Go South*, using the key letters for the direction, then the computer would move me to a new location.

I returned to the screen and sat in slow thought for a few moments wondering which way to go — when inspiration struck me. If I climbed a tree perhaps I would see which way was best. So I typed *U* for up and was abruptly informed "Can't go that way!". After ■ few abortive attempts to move ■ various directions I was suddenly inspired to write *Climb Tree* whereupon I was given a further instruction which told me . . . but that would spoil your fun.

As I moved through the game I began ■ get the hang of the main flaw in using a computer as a dungeonmaster, instead of as a real person: ■ has a very limited dictionary so ■ lot of the time you are struggling to find the appropriate word. I also found it very hard to keep my instructions down to two words, the first of which must be a verb.

Whenever I was really stuck I would type *Help* — sometimes it *would* help and sometimes it would remain infuriatingly unhelpful.

An example of this can be seen if I take the fifth adventure — called *The Count* and obviously inspired by Dracula. I was in his castle and had found a dumb-waiter which I was sure would take me to a new part of the adventure, but when I typed *Climb In* (or something like that — I'm not telling you everything) all I was told was that I was inside a dumbwaiter. I tried typing *Up* and *Down* to no avail. I was told "You can't go that way".

Eventually, I typed *Help* and had ■ smile at the response which came back — "I know how ■ *Raise* and *Lower* this thing." True enough, once I had keyed in *Raise Dumbwaiter* I was off into the adventure again.

There are five adventures in this series. The first, *Adventureland*, is a true dungeons and dragons saga where the object is to discover 13 treasures and store them in a safe place. The game starts ■ the forest, as I said, but soon moves underground — if you go wrong you can end up in hell itself. The second game, *Pirate Cove*, is another treasure hunt on a pirate island. But this time you start inside a flat in London where there are several strange items in a room upstairs, and a knowledge of carpentry can ■ of help(?).

In the third, *Mission Impossible*, you are plunged into a race against time as a bomb threatens to explode in a nuclear power station. This game comes complete with the tape-recorded instructions that the tv programme 'Mission Impossible' used ■ start with including "... this tape will self-destruct . . .", and is an ingenious and quite frustrating game. The fourth, *Voodoo Castle*, I have not yet managed to even start to crack as yet (I know I can do it, but all attempts have failed miserably, and I've been destroyed whenever, so far, I've attempted it), and involves trying to rescue a character called Count Christie from an evil curse. And the fifth, simply called *The Count*, is a chase story with Dracula trying to get you before you can get him.

There is a delightful sense of humour running throughout the games, and the computer's response often made me laugh out loud. I was particularly amused in the nuclear power plant when, at a crucial moment, a piece of paper fluttered to the floor. When I picked it up and read it, I was told ■ look for Adventure Number 4 at my favourite computer store.

I found another advertisement in *Pirate Cove* and doubtless have others still to discover. But the games can also be very frustrating, as ■ the case of being told an envelope contains a map and some keys but on writing *Open Envelope* I met with no success.

My overall impression of the games ■ that they are extremely stimulating, far more addictive than any I have seen, and well worth the money. I have heard the criticism that once you have worked them out they have lost all value. This may well be true, but as far as I can see, it will be a very long time before I will have completely solved a game, so I have many hours of pleasure ahead. And I would imagine that after a year of so it should be possible to return to the game and start afresh.

My children aged 8 and 12 have both become addicted. It is pleasurable ■ sit in a family group around the screen and play together, a factor missing from many computer games, sadly so, in my opinion. To have the combined meeting of minds adds to the fun.

My advice to the novice is to draw a map as described in the instructions right at the start — and ■ turn the game off and on again if stuck, as the second time around it is surprising what new paths you can uncover. More than that I will not say — ■ is up ■ you to find it out.

I must return to *Castle Dracula*, for evening is drawing in and soon the Count will awake, and I'm still stuck in that dumbwaiter

Instruction booklets for the Vic20 adventure series

Open Forum

Open Forum is for you to publish your programs and ideas.
It is important that your programs are bug free before you send them in. We cannot test all of them.
Contributions should be sent to: Popular Computing Weekly, *Hobhouse Court, 19 Whitcomb Street, London WC2H 7HF.*

How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs. (The usual fee is £10.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

Superposition

on ZX81

Superposition is a program which runs comfortably in 4K of Ram on a ZX-81. The program demonstrates the physical principle of superposition, which is concerned with wave motion and is a basic part of any physics 'A' level course and of some 'O' level courses.

The program starts by defining the principle of superposition and proceeds with instructions on how to use the program to generate graphs of super-imposed waves and their corresponding data on the ZX-printer (if available). The user is then invited to tell the computer how many waves he wishes to super-impose and how many points he wishes to be plotted. The relevant data for each wave is then entered, one wave at a time.

The data for each sine wave are the *amplitude* (the height of the wave), the *frequency* ■ the wave (the number of oscillations per second), and the *phase angle* (the value ■ the angle corresponding to the left-hand side of the screen).

When all the data has been entered, the computer performs the kind of operation for which computers were originally designed, that is a massive amount of tedious number-crunching in a relatively short period of time (even on a ZX81). The result is a graph representing the effect of super-imposing the effects of each wave.

This is an ideal example of how computers can be used in education and can be used to demonstrate the concepts of interference, beats (by taking waves of similar frequency), or simply wave motion in general.

When the graph has been produced the user has the option of *Copying* the graph to the printer, *Llisting* the data for the waves on the printer, or repeating the program with different data.

The program has been written as concisely as possible in order to suit users who may only have 4K of *Ram* at their disposal. This involves using all of the usual byte-saving techniques, but only in areas of the program which can afford the extra time consumed by using *Code* and *Val* etc. (i.e. not in the graph plotting routine).

Lines 0 to 35 are the explanation of how to use the program

Lines 40 to 70 Input the number of waves and the number of *plot* points

Lines 75 to 135 are a *For-Next* loop which take in the data for one wave every time a loop ■ made. Note the use of *Sgn Pi* ? ■ Line 75

Line 145 Puts the computer into *Fast* mode for speed if more than 100 points are to be plotted

Lines 150 to 190 are the routine which takes all of the wave data from array *A* and turns it into a graph.

Lines 195 to 225 deal with what the user decides to do when the graph has been finished (*Copy* graph, *List* data, *Stop* or *Run* again).

Lines 230 to 235 *Copy* the graph and return for another input.

Lines 240 to 280 *List* the data to the ZX-printer.

Lines 285 to 300 are the wait until the next key is pressed routine, called during the introduction ■ the beginning of the program

The data for the waves is stored in a number of array 'A', by lines 75 to 135. The data is stored in sections, the first third of the array storing amplitudes, the second third storing frequencies and the last third storing phase angles. This means a multi-dimensional array is not needed.

Line 175 checks that the y-coordinate of the plot point is ■ the range of the screen; if not then the point is not attempted to be plotted: one irritating feature of the ZX81 ■ that ■ will not ignore out-of-range *Plot* coordinates.

```
   5 REM *****SUPERPOSITION*****
  10 REM  (C)DAVID M. WEBB,1982
  15 SLOW
  20 PRINT "THIS PROGRAM ILLUSTR
ATES THE";,,"PHYSICAL PRINCIPLE
OF SUPER-";,,"POSITION, WHICH ST
ATES THAT ";,,"""THE NET DISPLAC
EMENT AT A GIVEN"";,,"PLACE AND TI
ME CAUSED BY A";,,"NUMBER OF WAV
ES WHICH ARE";,,"TRAVERSING THE
SAME SPACE IS THE";,,"SUM OF THE
DISPLACEMENTS WHICH";,,"WOULD HA
VE BEEN PRODUCED BY THE";,,"INDI
VIDUAL WAVES SEPERATELY."";,,"
  25 GOSUB VAL "285"
  30 PRINT "A GRAPH WILL BE DRAW
N OF THE";,,"RESULTANT DISPLACEM
ENT AGAINST";,,"TIME, OVER AN IN
TERVAL OF ONE";,,"SECOND. THE SC
REEN COVERS THE";,,"RANGE 21 TO
-21 CENTIMETRES.";,,"WHEN THE GR
APH IS FINISHED, INPUT";,,"""C"" T
O COPY";,,"""L"" TO LLIST DAT
A";,,"""S"" TO STOP";,,"OR
TO CONTINUE."
  35 GOSUB VAL "285"
  40 PRINT "NUMBER OF WAVES=";
  45 INPUT U
  50 PRINT U
  55 PRINT ,,"NUMBER OF  PLOT PO
INTS=";
  60 INPUT N
  65 PRINT N
  70 DIM A(U*INT PI)
  75 FOR A=SGN PI TO U
  80 CLS
  85 PRINT "NUMBER ";A;" OUT OF
 ";U;" WAVES"
  90 PRINT "AMPLITUDE(CM.)=";
  95 INPUT A(A)
 100 PRINT A(A)
 105 PRINT ,,"FREQUENCY(HERTZ)="
;
 110 INPUT A(A+U)
 115 PRINT A(A+U)
 120 PRINT ,,"PHASE ANGLE (RADS.
)=";
 125 INPUT A(A+U*2)
 130 PRINT A(A+U*2)
 135 NEXT A
 140 CLS
 145 IF N<VAL "100" THEN FAST
 150 FOR X=SIN PI TO N-SGN PI
 155 LET P=X*(N-1)
 160 LET Y=0
 165 FOR A=1 TO U
 170 LET Y=Y+A(A)*SIN (2*PI*A(A+
U)*P+A(A+2*U))
 175 IF ABS Y>21.75 THEN GOTO 19
0
 180 NEXT A
 185 PLOT P+53,21.75+Y
 190 NEXT X
 195 SLOW
 200 INPUT I$
 205 IF I$="C" THEN GOTO VAL "23
0"
 210 IF I$="D" THEN GOTO VAL "24
0"
 215 IF I$="S" THEN STOP
 220 CLS
 225 RUN  CODE "2"
 230 COPY
 235 GOTO VAL "200"
 240 LPRINT ,,,,U;" WAVES ARE SU
PERPOSED"
 245 LPRINT ,,N;" POINTS WERE PL
OTTED"
 250 FOR A=SGN PI TO U
 255 LPRINT ,,,,"DATA FOR WAVE "
;A;
 260 LPRINT ,,"AMPLITUDE=";A(A);
" CM."
 265 LPRINT ,,"FREQUENCY=";A(A+U
);" HZ."
 270 LPRINT ,,"PHASE ANGLE=",A(A
+2*U);" RADS."
 275 NEXT A
 280 GOTO VAL "200"
 285 IF INKEY$()"" THEN GOTO VAL
 "285"
```

```
  290 IF INKEY$<>"" THEN GOTO VAL
"290"
  295 CLS
  300 RETURN
```

THIS PROGRAM ILLUSTRATES THE PHYSICAL PRINCIPLE OF SUPER-POSITION, WHICH STATES THAT: "THE NET DISPLACEMENT AT A GIVEN PLACE AND TIME CAUSED BY A NUMBER OF WAVES WHICH ARE TRAVERSING THE SAME SPACE IS THE SUM OF THE DISPLACEMENTS WHICH WOULD HAVE BEEN PRODUCED BY THE INDIVIDUAL WAVES SEPERATELY."

A GRAPH WILL BE DRAWN OF THE RESULTANT DISPLACEMENT AGAINST TIME, OVER AN INTERVAL OF ONE SECOND. THE SCREEN COVERS THE RANGE 21 TO -21 CENTIMETRES. WHEN THE GRAPH IS FINISHED, INPUT
"C" TO COPY ,
"D" TO LLIST DATA;
"S" TO STOP .
N/L TO CONTINUE.

```
NUMBER OF WAVES=2
NUMBER OF  PLOT POINTS=540
```

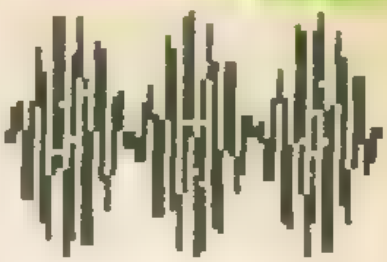
```
NUMBER 1 OUT OF 2 WAVES.
AMPLITUDE(CM.)=10
FREQUENCY(HERTZ)=1
PHASE ANGLE (RADS.)=0

NUMBER 2 OUT OF 2 WAVES:
AMPLITUDE(CM.)=10
FREQUENCY(HERTZ)=5
PHASE ANGLE (RADS.)=3.1415927
```

```
2 WAVES ARE SUPERPOSED
500 POINTS WERE PLOTTED

DATA FOR WAVE 1:
AMPLITUDE=10 CM.
FREQUENCY=1 HZ.
PHASE ANGLE=0 RADS.

DATA FOR WAVE 2
AMPLITUDE=10 CM.
FREQUENCY=5 HZ.
PHASE ANGLE=3.1415927 RADS.
```



```
2 WAVES ARE SUPERPOSED
5000 POINTS WERE PLOTTED

DATA FOR WAVE 1
AMPLITUDE=10 CM.
FREQUENCY=17 HZ.
PHASE ANGLE=0 RADS.

DATA FOR WAVE 2.
AMPLITUDE=10 CM.
FREQUENCY=10 HZ.
PHASE ANGLE=3.1415927 RADS.
```

Superposition
by David Webb

League Table

on BBC Micro

For all the football enthusiasts this listing is for the Football League Division One. It can be adapted for any football league. All that need changing are the team names in the Data statements in lines 730-760.

These should be placed in alphabetical order and based on this order the teams are numbered from 1 on (league total). In line 30 J% is set the number of teams in the league less one.

The names given to the files in lines 130 and 600 can be changed to suit. The title can be changed in line 430. The variable names are mainly self-explanatory. The original name *Draw* had to be substituted by D, because of the confusion with the command word *Draw*.

When entering the team numbers and scores in lines 270-290, a check is kept that duplicate team numbers are not entered and the program allocated points and goals scored to the correct teams. These are sorted before printing out the new league tables. Should a printer not be available then lines 420, 440 and 520 will not be required.

The team statistics are sorted back into alphabetical order ready for reading back into the program on the next run

```
    10 MODE 0
    20 INPUT "IS THIS THE  IRST RUN OF THE PROGRAM /   TYPE Y FOR
YES AND N FOR N";A$:IF A$="N" OR A$="n" THEN GOTO20 ELSE GOTO40
    30 J%=21
    40 INPUT"HOW MANY REBUILD TO RECORDINGS
    50 DIM TM(J%),PLAYED(J%),WON(J%),DRAW(J%),LOST(J%),GF(J%),GA(J%),
PTS(J%),M(J%),NAME$(J%)
    60 IF A$="Y"PROCINIT:GOTO250
   110 MFX 137,1
   120 MFX 7,7
   130 A=OPENIN ("LEAGUE1")
   140 FOR N%=0 TO J%
   150 INPUT#A,NAME$(N%),PLAYED(N%),WON(N%),LOST(N%),DRAW(N%),
=BGET#A:LOST(N%)=BGET#A:GF(N%)=BGET#A:GA(N%)=BGET#A:PTS(N%)
=BGET#A:NEXT#N%
   240 CLOSE#A
   245 MFX 137,0
   250 FOR N%=0 TO J%:READ NAME$(N%):NEXT#N%
   260 FOR M% = 1 TO J%
   270 INPUT "HOME TEAM NUMBER AND SCORE ";M1,SC1
   280 IF M1=M1+1 THEN 270 ELSE M(M1)=1
   290 INPUT "AWAY TEAM NUMBER AND SCORE ";M2,SC2
   300 IF M(M2) = 1 THEN 290 ELSE M(M2)=1
   301 PLAYED(M1)=PLAYED(M1)+1:PLAYED(M2)=PLAYED(M2)+1:GF(M1)
=GF(M1)+SC1:GA(M1)=GA(M1)+SC2:GF(M2)=GF(M2)+SC2:GA(M2
=GA(M2)+SC1
   310 IF SC1>SC2 PROCHOME:GOTO340
   320 IF SC1=SC2 PROCDRAW:GOTO340
   330 PROCLOSE
   340 NEXT#N%
   350 BX=BX+2
   360 REPEAT
   370 IF PTS(BX)<PTS(BX+1) PROCSWITCH:GOTO390
   380 IF PTS(BX)=PTS(BX+1) PROCDEC
   390 BX=BX+1
   400 UNTIL BX=J%
   410 IF BX=1 GOTO350
   420 VDU2,1,27,1,14
   430 PRINT"LEAGUE DIVISION ONE"
   440 VDU1,27,1,15
   450 PRINT"                                        GOALS
   460 PRINT"   TEAM NAME              P   W   D   L   F   A  PTS"
   470 FOR N%=0 TO J%
   480 M%=IN(N%)
   490 PRINT#N%+1;TAB(6);NAME$(M%);TAB(24);PLAYED(M%);TAB(28);
```

```
WON(M%);TAB(31);DRAW(M%);TAB(34);LOST(M%);TAB(37);GF(M%);TAB(40);
GA(M%);TAB(44);PTS(M%)
   500 NEXT
   510 END
   520 REM
   530 DEFPROCHOME
   540 WON(TM1)=WON(TM1)+1:PTS(TM1)=PTS(TM1)+3
   550 LOST(TM2)=LOST(TM2)+1
   560 ENDPROC
   570 REM ************************************************
   580 DEFPROCDRAW
   590   TM1)=D(TM1)+1:PTS(TM1)=PTS(TM1)+1
   600   TM2)=D(TM2)+1:PTS(TM2)=PTS(TM2)+1
   610 ENDPROC
   620 REM ************************************************
   630 DEFPROCSWITCH
   640 FOR N%=0 TO J%
   650 IF PTS(N%)<PTS(N%+1) THEN PROCSWAP
   660 NEXT
   670 ENDPROC
   680 REM ************************************************
   690 DEFPROCSWAP
   700 SWAP PTS(N%),PTS(N%+1)
   710 SWAP NAME$(N%),NAME$(N%+1)
   720 SWAP M(N%),M(N%+1)
   730 DATA ARSENAL , ASTON VILLA ,"BIRMINGHAM", BRIGHTON",
"COVENTRY","EVERTON
   740 DATA IPSWICH", LIVERPOOL , LUTON","MAN.CITY", MAN.UTD ,
NORWICH
   750 DATA"N FOREST", NOTTS COUNTY", "SOUTHAMPTON","STOKE
CITY", SUNDERLAND
   760 DATA"TRANSFA ,"TOTTENHAM ,"WATFORD","WEST BROM , WEST HAM"
   770 REM ************************************************
   780 DEFPROCDRAW
   790 WON(TM1) WON(TM1)+1:PTS(TM1)=PTS(TM1)+3
   800 LOST(TM2)=LOST(TM2)+1
   810 ENDPROC
   820 REM ************************************************
   830 DEFPROCDRAW
   840   TM1)=D(TM1)+1:PTS(TM1)=PTS(TM1)+1
   850   TM2)=D(TM2)+1:PTS(TM2)=PTS(TM2)+1
   860 ENDPROC
   870 REM ************************************************
   880 DEFPROCSWITCH
   890 FOR N%=0 TO J%
   900 IF PTS(N%)<PTS(N%+1) THEN PROCSWAP
   910 NEXT
   920 ENDPROC
   930 REM ************************************************
   940 DEFPROCSWAP
   950 SWAP PTS(N%),PTS(N%+1)
   960 SWAP NAME$(N%),NAME$(N%+1)
   970 SWAP M(N%),M(N%+1)
   980 ENDPROC
   990 REM ************************************************
  1000 DEFPROCDEC
```

to next page

from previous page

```
1140 Z%=TN(S%):Y%=PLAYED(S%):X%=WON(S%):W%=D(S%):V%=LOST(S%):T%=GF(S%):U%=GA(S%):R%=PTS(S%)
1165 TN(S%)=TN(S%+1):PLAYED(S%)=PLAYED(S%+1):WON(S%)=WON(S%+1):D(S%)=D(S%+1):LOST(S%)=LOST(S%+1):GF(S%)=GF(S%+1):GA(S%)=GA(S%+1):PTS(S%)=PTS(S%+1)
1180 TN(S%+1)=Z%:PLAYED(S%+1)=Y%:WON(S%+1)=X%:D(S%+1)=W%:LOST(S%+1)=V%:GF(S%+1)=T%:GA(S%+1)=U%:PTS(S%+1)=R%:C%=1
1200 ENDPROC
1210 REM ************************************************************
1220 DEFPROCDEC
1230 DIFF1=GF(S%)-GA(S%):DIFF2=GF(S%+1)-GA(S%+1)
1240 IF DIFF1<DIFF2 PROCSWITCH:ENDPROC
1250 IF DIFF1=DIFF2 PROCDEC2
1260 ENDPROC
1270 REM ************************************************************
1280 DEFPROCDEC2
1290 IF WON(S%)<WON(S%+1) PROCSWITCH:ENDPROC
1295 IF WON(S%)=WON(S%+1) PROCDEC3
1300 ENDPROC
1310 REM ************************************************************
1320 DEFPROCINIT
1330 FOR N%= 0 TO J%
1340 TN(N%)=N%:PLAYED(N%)=0:WON(N%)=0:D(N%)=0:LOST(N%)=0:GF(N%)=0:GA(N%)=0:PTS(N%)=0
1360 NEXTN%
1370 ENDPROC
1380 REM ************************************************************
1390 DEFPROCDEC3
1400 IF GF(S%)<GF(S%+1) PROCSWITCH:ENDPROC
1410 IF GF(S%)=GF(S%+1) PROCDEC4
1420 ENDPROC
1430 REM ************************************************************
1440 DEFPROCDEC4
1450 IF NAME$(TN(S%))>NAME$(TN(S%+1)) PROCSWITCH
1460 ENDPROC
>VDU3
```

LEAGUE DIVISION ONE

DATE - 28 AUG 82

	TEAM NAME	P	W	D	L	GOALS F	GOALS A	PTS
1	MAN.UTD	1	1	0	0	3	0	3
2	SUNDERLAND	1	1	0	0	3	1	3
3	LIVERPOOL	1	1	0	0	2	0	3
4	WATFORD	1	1	0	0	2	0	3
5	MAN.CITY	1	1	0	0	2	1	3
6	NOTTM FOREST	1	1	0	0	2	1	3
7	STOKE CITY	1	1	0	0	2	1	3
8	COVENTRY	1	1	0	0	1	0	3
9	LUTON	1	0	1	0	2	2	1
10	TOTTENHAM	1	0	1	0	2	2	1
11	BRIGHTON	1	0	1	0	1	1	1
12	IPSWICH	1	0	1	0	1	1	1
13	NOTTS COUNTY	1	0	1	0	0	0	1
14	SWANSEA	1	0	1	0	0	0	1
15	ARSENAL	1	0	0	1	1	2	0
16	NORWICH	1	0	0	1	1	2	0
17	WEST HAM	1	0	0	1	1	2	0
18	SOUTHAMPTON	1	0	0	1	0	1	0
19	ASTON VILLA	1	0	0	1	1	3	0
20	EVERTON	1	0	0	1	0	2	0
21	WEST BROM	1	0	0	1	0	2	0
22	BIRMINGHAM	1	0	0	1	0	3	0

League Table
by B. Gagg

Mystery

on Vic-20

Most Vic20 users probably, like myself, assess a program by looking at the listing and getting a rough idea of what it is going to do. But this program I have called Mystery Program as I am confident that no Vic20 users could look at the listing and have any idea what the program does.

The program as it stands will only be run on an unexpanded Vic due to the start of basic location (4096). Adjusting line 40 to *For* P=1024 to 1214 . . . should make it run with a 3K expansion.

The program is only short so don't expect miracles, but the way in which it works should be of interest to some, and is a basis for future experiment. Lines 10 and 20 can contain any letters but there must be at least two complete lines of them (160).

Save the program before you run it because if you have made a mistake you'll have to power down and start again. Now key it in and see what it does.

```
10 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXX
20 REM XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXX
40 FORP=4096TO4286 READD POKEP,D:NEXT
50 DATA0,61,16,1,0,151,51,54,56,55,57,44,56,58,153,34,147,5,17,17,17,17,17,17,17
,17,17
60 DATA29,85,83,69,32,67,85,82,83,79,82,32,67,79,78,84,82,79,76,83,34,58,129,85,
178,49
70 DATA164,50,48,48,48,58,138,8,96,16,2,0,65,178,55,57,48,48,58,66,178,49,49,58,
68,178,56
80 DATA49,54,52,58,129,74,178,49,164,50,52,58,153,58,130,0,148,16,3,0,151,68,178
,181,48
90 DATA50,50,172,187,48,49,41,41,44,52,58,58,151,65,178,66,44,51,58,58,153,58,13
9,194,48
100 DATA49,57,55,41,178,51,49,175,66,177,49,167,66,178,66,171,49,0,174,16,4,0,13
9,194
110 DATA40,49,57,55,41,178,50,51,175,66,179,50,49,167,66,178,66,178,49,0,189,16,
5,0,151
120 DATA65,178,66,44,50,50,58,137,51,0,0,0

READY.
```

Mystery
by Andy Horrell

Letter Writer

on Vic-20

This program offers a word processing capability for the home user. Whilst not offering a full processing system as in professional systems, it does provide an easy and workable system.

Upper and lower case is used, with up to 30 lines of text available, not including address, heading and usual letter ending.

Lines 8 to 13; and 3265 to 3269 are an optional motif which the user can design to his own liking. As lines of text are entered, a 'score' shows how many have been entered so far. The user should put his address in the appropriate places shown in the listing, and they will appear automatically when run.

The user enters his lines when asked, up to 40 characters of text per line. Should he enter too many characters the cursor will return to the beginning of that line; the user should then move the cursor along and shorten that line to less than 40 characters.

The last line typed is then displayed with an option to correct it if required. Corrections cannot be made to that particular line after this chance. When all message text has been entered, but before 'yours . . . etc' — the user enters 'xx' as one would enter a normal sentence. He can then enter yours faithfully, and hit return.

At this point the whole letter (other than personal motif) is displayed on the screen. If you have typed in a large letter use 'control' to view it as it scrolls up the screen. When viewed, the user hits any key and the printout option is displayed. If printer accepted by user, the whole letter is then printed on the Vic printer (GP80) in double-size text (hence 40 characters per line). After printing, an option for second copy is offered.

from previous page

```
7 POKE36869,242
8 PRINT"■"
9 D1$= "■              ■"
10 D2$="■              ■"
11 D3$="■ R.BARTON.■"
12 D4$="■              ■"
13 D5$="■              ■"
20 PRINT"ADDRESS IS AUTOMATIC"
25 PRINT"■■■■■■"
30 S$="YOUR STREET"
40 T$="TOWN"
50 CO$="COUNTY"
70 PRINT"DATE?"
80 INPUTDA$
90 PRINT"■1ST.SENTENCE?"
99 DIMM$(30)
100 X=1
105 PRINT"■■■■■■■■■■■■■■■■SENTENCE NO."X
120 PRINT"■":INPUTM$(X)
130 IFM$(X)="XX"THEN472
132 IFLEN(M$(X))>39THEN120
133 PRINT"■IS THIS TO BE ACCPTD?■■■"
134 PRINT"■":PRINTM$(X):INPUTM$(X)
135 X=X+1
140 PRINT"■":GOTO105
472 PRINT"■ENDING...."
473 INPUTE$
900 PRINT"■SIGNED...."
920 INPUTSI$
1000 GOTO2999
2999 PRINT"■"
3000 PRINTTAB(21-LEN(S$))S$
3002 PRINTTAB(21-LEN(T$))T$
3004 PRINTTAB(21-LEN(CO$))CO$
3005 PRINTTAB(21-LEN(DA$))DA$
3020 FORX=1TO30
3021 IFM$(X)="XX"THEN3099
3022 PRINTM$(X)
3025 NEXTX
3099 PRINTE$
3100 PRINT"■■"TAB(21-LEN(SI$))SI$
3200 GETA$:IFA$=""THEN3200
3210 PRINT"■■■■■■■■■DO YOU REQUIRE"
3220 PRINT"■■■■■■■PRINTOUT?"
3230 PRINT"■■■■■■■■■■■■■Y/N■"
3240 GETA$:IFA$=""THEN3240
3250 IFA$="N"THENEND
3260 OPEN1,4
3265 PRINT#1,CHR$(14)CHR$(16)"10"D1$
3266 PRINT#1,CHR$(18)CHR$(16)"10"D2$
3267 PRINT#1,CHR$(18)CHR$(16)"10"D3$
3268 PRINT#1,CHR$(18)CHR$(16)"10"D4$
3269 PRINT#1,CHR$(18)CHR$(16)"10"D5$
3280 PRINT#1,CHR$(10)
3281 PRINT#1,CHR$(10)
3287 PRINT#1,CHR$(146)CHR$(17)CHR$(16)"4
8"S$
3290 PRINT#1,CHR$(17)CHR$(16)"48"T$
3300 PRINT#1,CHR$(17)CHR$(16)"48"CO$
3310 PRINT#1,CHR$(17)CHR$(16)"43"DA$
3312 PRINT#1,CHR$(10)
3313 PRINT#1,CHR$(10)
3315 FORX=1TO30
3317 IFM$(X)="XX"THEN3419
3320 PRINT#1,CHR$(17)M$(X)
3325 NEXTX
3417 PRINT#1,CHR$(10)
3418 PRINT#1,CHR$(10)
3419 PRINT#1,CHR$(17)CHR$(16)"30"E$
3420 PRINT#1,CHR$(10)
3425 PRINT#1,CHR$(17)CHR$(16)"45"SI$
3430 CLOSE1,4
3440 PRINT"■■■■■■■■■■ANOTHER COPY"
3450 GETA$:IFA$=""THEN3450
3460 IFA$="Y"THEN3260
3470 CLOSE1:END
```

Letter Writer
by Richard Barton

Alien

on Spectrum

This is a fast-moving arcade-style game. Instructions are in the program. The aliens move up the screen using the automatic scroll and the "scroll counter" is *Poked* (*Poke* 23692,255) for smooth graphics.

The difficulty may be increased by changing line 65. This line chooses a random square beneath your ship — if it finds a "#" (centre of alien) and then a random number greater than .65, it fires. To make it more difficult, change the .65 to .2. Or to make it easier, change it to .8.

In line 100 the ship is made of a "(Graphic 'A')(INV#)(Graphic 'B')". My high score is 32.

```
1 LET h=0: LET n$=" "
10 LET n=0: FOR f=0 TO 7: LET n=n+2↑f: POKE USR "a"+f,n: NEXT f
20 LET n=0: FOR f=7 TO 0 STEP -1: LET n=n+2↑f: POKE USR "b"+7-f,n: NEXT f
30 GO SUB 500: LET a=10: LET b=0: LET s=0
40 BORDER 0: PAPER 0: INK 7: CLS
45 POKE 23692,255
50 LET a=a+(INKEY$="8" AND a<28)-(INKEY$="5" AND a>0)
60 PRINT INK 6;AT 0,a;" U "
65 LET [illegible]=RND*20: IF SCREEN$ (1[illegible]) ="#" THEN IF RND>.65 THEN GO TO 400
70 IF b>0 THEN GO TO 200
75 IF INKEY$="0" THEN GO TO 190
80 IF RND>.2 THEN GO TO 50
90 PRINT AT 21,0
95 POKE 23692,-1
100 PRINT TAB RND*27; INK 4;"[illegible]": IF SCREEN$ (0,a+1)<>" " THEN GO TO 300
110 GO TO 50
190 LET b=1: LET b1=a+1: LET m=0
200 PRINT AT b,b1;" ": LET b=b+1: LET b1=b1+m
210 IF b1=-1 THEN LET b1=31
215 IF b1=32 THEN LET b1=0
220 IF b>21 THEN LET b=0: GO TO 50
225 LET a$=SCREEN$ (b,b1)
226 RESTORE
230 IF a$="#" THEN GO TO 350
235 IF a$<>" " THEN GO TO 250
240 PRINT AT b,b1;".": GO TO 50
250 LET m=-(SCREEN$ (b,b1+1)="#"): IF m=0 THEN LET m=1
255 LET b=b-1: LET b1=b1+m: IF b>21 THEN LET b=0: GO TO 50
260 GO TO 225
300 RESTORE: FOR f=1 TO 10: READ q$: FOR g=1 TO 5: PRINT AT 0,a+1;q$(g): NEXT g: NEXT f
310 CLS: PRINT "you scored ";s
311 IF s>h THEN PRINT '"You have the top score of ";s: INPUT "your name ";n$: LET h=s
320 IF INKEY$="" THEN GO TO 320
330 GO TO 30
350 FOR f=1 TO 10: READ q$: PRINT AT b,b1-1;q$: NEXT f: LET s=s+1: LET b=0: GO TO 50
400 FOR f=6 TO 0 STEP -1: PRINT AT f,a+1;"[illegible]": BEEP .5,f+3: NEXT f: GO TO 300
500 CLS: PRINT "____________ALIEN STORM____________"
510 PRINT "Your ship has [illegible] a fleet of oncoming aliens. You must"
520 PRINT "(1) Avoid them, [illegible]"
530 PRINT "(2) Blast them with your gun"
540 PRINT '''"BEWARE-they shoot only if you stay above them for too long (they never miss)."
550 PRINT [illegible] FLASH 1;"PRESS ANY KEY"
560 PAUSE 0: CLS
570 PRINT "CONTROLS....."
580 PRINT '''"[illegible] 8=left [illegible] 5=right [illegible] space=fire"
590 PRINT '''"HINT aim for the centre of the alien [illegible] your bombs 'bounce' off their wings"
600 PRINT FLASH 1;"PRESS ANY KEY"
610 PAUSE 0: CLS
620 PRINT "The high score is ";h
640 PRINT '"by ";n$
650 PRINT [illegible] FLASH 1;"PRESS ANY KEY"
660 PAUSE 0: CLS: RETURN
999 DATA [illegible]
```

Alien
by Nick Wilson

```
1 REM CHARACTER CHANGE FOR 16K ZX SPECTRUM
2 REM [illegible]
5 CLEAR [illegible]
10 FOR [illegible] TO [illegible]: POKE [illegible],255: NEXT [illegible]
20 FOR [illegible] TO [illegible]
30 LET [illegible]=PEEK ([illegible])
40 POKE [illegible]: NEXT [illegible]
50 FOR [illegible] TO [illegible]: READ x: POKE [illegible]: NEXT [illegible]
55 REM [illegible]
60 DATA 0,126,[illegible]
65 DATA 0,126,[illegible]
70 FOR [illegible] TO [illegible]
80 LET [illegible]=PEEK ([illegible])
90 POKE [illegible]: NEXT [illegible]
100 FOR [illegible] TO [illegible]
110 READ [illegible]: POKE [illegible]: NEXT [illegible]
120 DATA 0,[illegible],126,66,66,66,0,0,124,66,[illegible],0,0,126,64,64,64,[illegible]
130 DATA 0,[illegible],126,[illegible],0,0,126,64,[illegible],64,126,64,64,[illegible]
140 DATA 0,[illegible],66,66,126,66,66,66,0,0,28,8,8,8,28,0,0,126,0,0,[illegible],66,0
160 DATA 0,66,68,[illegible],66,0,64,64,64,64,[illegible],0,126,[illegible],90,90,90,[illegible],66,66,66,66,0
165 DATA 0,126,[illegible],66,126,0,0,126,66,126,64,64,64,0,0,126,66,[illegible]
170 DATA 0,[illegible],0,0,126,64,126,2,2,126,0,0,126,0,0,0,0,0,66,66,66,66,66,126,0
180 DATA 0,66,[illegible],0,0,90,90,90,90,126,0,0,66,36,24,24,36,66,0,0,[illegible],126,2,2,126,0,0,126,2,4,8,[illegible]
200 FOR [illegible]=32204 TO [illegible]
210 LET [illegible]=PEEK ([illegible])
220 POKE [illegible]: NEXT [illegible]
```

Character Change
by Gavin Tapp

Character Change

on Spectrum

ZX Character change converts all the standard ZX numbers and capital letters to more digital styled ones. The program works by poking part of the *Rom* into the top of the *Ram*, but changing some of the characters as it does so.

After entering the listing type: *Run*. If nothing has gone wrong so far type in: *Poke* 23606,88:*Poke* 23607,123 then list. If all has gone well you will see that all the numbers and capitals will look digital.

You can now *New* the program (don't worry, only the program will disappear, not the characters). To save the characters use: *Save* "Name of program" *Code* 31574,1025. To load in use. *Clear* 31574:*Load*""*Code*.

You can now do what you like with the new numbers and letters, and change between the two by using: *Poke* 23606,88:*Poke* 23607,123 to go into new character mode or use *Poke* 23606,0 *Poke* 23607,60 to return back to normal letters and numbers

Minipro

on BBC

This program sets up the user definable keys of a BBC microcomputer so that it can be used as a simple word processor. Text is entered into a program so that the existing editing facilities of the computer can be used to make corrections. Text can be printed by *Running* it to the printer and *Saved* on cassette.

Far from idiot proof it is intended for the computer hobbyist as a useful aid to letter writing, or as here, to writing program documentation.

Program notes:

Lines 60 to 150 set up the red keys:—

KEY0 removes the program, starts the auto line numbering, and inserts the first print statement so that typing can commence after a single keystroke

KEY1 enables the move to a new line as easily as if you were pressing the carriage return on a typewriter.

KEY2 is used instead of KEY1 if the next line requires a *Tab*.

KEY3 enables the *Tab* arising from KEY2 to be closed with a single key.

KEY4 is used when you want to start editing and after *Escape*ing from the text program. After pressing this key you edit as you would any program on the BBC micro.

The listing is in page mode, and you therefore have to use *Escape* before editing, and *Shift* to scroll. If you want to restart the text program use *Auto* and the appropriate line number followed by *Print*

When finished it is best to make sure the printer is off (KEY6), and *Run* the text program to see on the screen precisely how it will eventually appear on paper. KEY4 will then re-enter edit mode if required

KEY5 is used to print the text, so make sure the editing is complete and the printer is correctly set up before you press it.

KEY6 switches the printer off. Make sure you press this after printing is finished otherwise you may get some unwanted additions to your text when you next use the keyboard.

KEY7 is pressed after *Escape*ing from the text program to see how much memory is left.

KEY8 gives 10 spaces for convenient starts to new paragraphs etc.

KEY9 gives 55 spaces for convenient addressing at the top R.H.S. of letters

Mode 3 is used to get a relatively easy visual indication of the line length for the 80-column printer being used.

Lines 170 to 200 print a reminder of the key definitions and set up a full width text window for the display.

Line 210 speeds up the cursor for editing purposes

Main difficulty

The main difficulty is in deciding when to use a new line. You can get three full printed lines on each program line before the *Beep* tells you the line is full. Then you can delete the last word and use KEY1 or KEY2 to start the new line. Easy enough, but the full program line cramps your style on editing. It is probably best to have 2 lines of print for each program line.

Any ideas for improvements would be welcome. It would be interesting to see how many extra features can be added without using any *Ram*. There could be scope for machine code routines down in the operating system area.

To operate Minipro simply *Load* and *Run*. If you are starting a new text, commence with KEY0, otherwise *Load* the text program you intend to modify and commence with KEY4. If you are not using a monitor and find the *Mode3* text difficult to read accurately, you can always do a final check-run in *Mode7* before printing.

```
L.
   10REM ***MINIPRO***
   20REM MINIATURE WORD PROCESSOR
   30REM BY C.R.WOODINGS
   40REM VERSION 1.1 / 30 AUGUST 1982
   50REM NEEDS A MODEL B BBC MICROCOMPUTER
   60*KEY0 NEW:M:CAUTO:MP."
   70*KEY1 """:MP.""  "
   80*KEY2 """:MP.TAB("
   90*KEY3 )"
  100*KEY4 :C:NLIST:M
  110*KEY5 :ORUN:B:M
  120*KEY6 :C
  130*KEY7 V.11:DIMP%-1:P.(HIMEM-P%);" BYTES LEFT
":M
  140*KEY8 "          "
  150*KEY9 "                                                  "
  160MODE3:COLOUR0:COLOUR129:CLS
  170PRINT"                                          ***MINIPRO***"'
  180PRINT"  f0=Start; f1=Newline; f2=Newline with Tab;
f3=CloseTab; f4=Edit; f5=Print"
  190PRINT"       f6=Printer Off;  f7=Available Memory;
f8=TAB(10);  f9=TAB(55)"
  195PRINT" ************************************************
**************************************"
  200VDU 28,0,24,79,5
  210*FX 12,3
  220END
```

Minipro
by Chris Woodings

Tennis

on Spectrum

This is a two-player game which will run on a 16k Spectrum. The idea of the game is to destroy as many bricks as possible in your opponent's wall with the ball during each rally whilst protecting your own wall.

Each rally lasts for twenty strokes and there are six rallies to one game. Returning the ball safely scores five points and destroying one brick scores ten.

If the ball returns from the wall through your bat then part of your bat will disappear. It will return when the bat is moved. Instructions showing how to move the bats are given in the program.

In order to detect the bat and the bricks the program uses the *Attr* function and so if any changes are made to the colours used in the program then it may be necessary to change the corresponding *Attr* functions.

Program notes.

Lines

10-40	Set up the user defined graphics for the bricks and the ball.
50-150	Set up the playing area with each brick having a random colour.
210	Reverses the direction of entry of the ball for successive rallies.
240-250	Put the ball into play in a random direction from a random position near the centre of the screen.
900-940	Read the keyboard using the *in* function in order to move the bats. This command, unlike *inkey$*, will still work if more than one key is depressed on the keyboard. Thus, both players can move their bats simultaneously.
1000-1090	Decide at which of the three possible angles the ball will rebound from the bat. This depends on where the ball hits the bat. If the ball misses the bat it will carry on to the wall.
1200-1350	Determine whether the ball has hit a brick in the wall and if so will remove it and increment the score.
2000-2350	Move the bats up and down according to the input as read from the keyboard.

Graphics Notes.

Lines

10	Graphics "A"
20	Graphics "B"
30	Graphics "C"
90	Graphics shifted "B"
150	Graphics "5" and graphics shifted "5"

```
   1 REM
   2 REM
   3 REM
   4 REM
   5 BORDER 5
  10 FOR x=0 TO 7: READ a: POKE
USR "A"+x,a: NEXT x
  20 FOR x=0 TO 7: READ a: POKE
USR "B"+x,a: NEXT x
  30 FOR x=0 TO 7: READ a: POKE
USR "C"+x,a: NEXT x
  40 DATA 0,126,126,126,126,126,
126,126,126,126,126,126,126,126,
126,0,0,24,60,126,126,60,24,0
  44 GO TO 4000
  45 LET y=1: LET lscore=0: LET
rscore=0
  50 FOR x=1 TO 5
  60 PRINT AT 0,2,lscore;AT 0,12
;"RALLY ";x;AT 0,27;rscore
  90 PRINT AT 1,0,"INK 5;"
 100 FOR a=2 TO 20 STEP 2
 105 INK (RND*4)+4: PAPER RND*4
 110 PRINT AT a,31,"A";AT a+1,31
;"B"
 115 INK (RND*4)+4: PAPER RND*4
 120 PRINT AT a,0,"A";AT a+1,0;"
B"
 125 NEXT a
 130 PAPER 7: INK 0
 140 LET bleft=11: LET bright=bl
eft
 150 FOR a=10 TO 12: PRINT AT a,
2,INK 1,"B";AT a,29,INK 1,"B":
NEXT a
 210 LET y=-y
 220 LET intx=y
 230 LET inty=INT (RND*3)-1
 235 LET rally=0
 240 LET ballx=INT (RND*10)+11:
LET bally=INT (RND*10)+A: PAPER
0,10
 250 PRINT AT bally,ballx;"C"
 255 GO SUB 900
 260 IF ballx=3 AND intx=-1 THEN
 GO SUB 1000
```

```
  261 IF ballx=26 AND intx=1 THEN
  GO SUB 1850
  265 IF ballx=1 THEN GO SUB 1200
  266 IF ballx=30 THEN GO SUB 130
0
  270 LET ballx=ballx+intx: LET b
ally=bally+inty
  275 IF bally<2 OR bally>21 THEN
  GO SUB 1100
  280 PRINT AT bally-inty,ballx-i
ntx;" "
  290 IF rally>=20 THEN GO TO 300
0
  350 GO TO 250
  899 STOP
  900 IF IN 64510=254 THEN GO SUB
  2000
  910 IF IN 65022=254 THEN GO SUB
  2100
  920 IF IN 57342=254 THEN GO SUB
  2200
  930 IF IN 49150=253 THEN GO SUB
  2300
  940 RETURN
 1000 IF bally=bleft THEN LET int
y=0
 1010 IF bally=bleft+1 THEN LET i
nty=1
 1020 IF bally=bleft-1 THEN LET i
nty=-1
 1025 IF ATTR (bally,ballx-1)=56
THEN GO TO 1035
 1030 LET intx=-intx: BEEP .03,30
: LET lscore=lscore+5: PRINT AT
0,2,lscore
 1035 LET rally=rally+1
 1040 RETURN
 1050 IF bally=bright THEN LET in
ty=0
 1060 IF bally=bright+1 THEN LET
inty=1
 1070 IF bally=bright-1 THEN LET
inty=-1
 1075 IF ATTR (bally,ball+1)=56
THEN GO TO 1085
 1080 LET intx=-intx: BEEP .03,30
: LET rscore=rscore+5: PRINT AT
0,27,rscore
 1085 LET rally=rally+1
 1090 RETURN
 1099 STOP
 1100 LET inty=-inty
 1110 LET bally=bally+2*inty
 1120 RETURN
 1200 IF ATTR (bally,8)=56 THEN G
O TO 1240
 1210 LET hit=bally
 1220 IF hit/2-INT (hit/2)<.1 THE
N LET hit=hit+1
 1230 PRINT AT hit,0," ";AT hit-1
,0;" "
 1235 BEEP .1,-20: LET rscore=rsc
ore+10: PRINT AT 0,27;rscore
 1240 LET intx=-intx
 1250 RETURN
 1300 IF ATTR (bally,31)=56 THEN
GO TO 1340
 1310 LET hit=bally
 1320 IF hit/2=INT (hit/2)<.1 THE
N LET hit=hit+1
 1330 PRINT AT hit,31;" ";AT hit-
1,31;" "
 1335 BEEP .1,-20: LET lscore=lsc
ore+10: PRINT AT 0,2;lscore
 1340 LET intx=-intx
 1350 RETURN
 2000 IF bleft<3 THEN GO TO 2050
 2010 LET bleft=bleft-1
 2020 FOR a=bleft-1 TO bleft+1: P
RINT AT a,2; INK 1;"▮": NEXT a
PRINT AT bleft+2,2;" "
 2050 RETURN
 2100 IF bleft>=20 THEN GO TO 2150
 2110 LET bleft=bleft+1
 2120 FOR a=bleft-1 TO bleft+1: P
RINT AT a,2; INK 1;"▮": NEXT a:
PRINT AT bleft-2,2;" "
 2150 RETURN
 2200 IF bright<3 THEN GO TO 2250
 2210 LET bright=bright-1
 2220 FOR a=bright-1 TO bright+1:
 PRINT AT a,29; INK 1;"▮": NEXT
a: PRINT AT bright+2,29;" "
 2250 RETURN
 2300 IF bright>=20 THEN GO TO 235
0
 2310 LET bright=bright+1
 2320 FOR a=bright-1 TO bright+1:
 PRINT AT a,29; INK 1;"▮": NEXT
a: PRINT AT bright-2,29;" "
 2350 RETURN
 3000 FOR fa=1 TO 10: FOR g=14 TO
 16: BEEP .01,g: NEXT g: NEXT f
 3010 PRINT AT 5,8,"END OF RALLY
 ";x;AT 9,7;"PRESS ANY KEY TO";AT
 11,11;"CONTINUE"
 3020 IF INKEY$="" THEN GO TO 300
0
 3025 CLS
 3030 NEXT x
 3040 PRINT AT 10,8;"DO YOU WANT
TO PLAY AGAIN? (Y/N)"
 3045 IF INKEY$="" THEN GO TO 304
5
 3050 IF INKEY$="y" THEN GO TO 39
00
 3060 STOP
 3900 CLS
 4000 PRINT AT 5,8;"The idea of t
he game is to ""destroy your op
ponent's ball""with the ball wh
ilst protecting""your own by de
flecting the ball""with your ba
t. Each game ""consists of six
rallies each""of twenty strokes"
 4010 PRINT AT 14,8;"O -bat up
                    O -bat down"
 4020 PRINT AT 20,6,"press any ke
y"
 4030 IF INKEY$="" THEN GO TO 403
0
 4040 CLS : GO TO 45
```

Tennis
by Colin Leach

Bad Feature

on Dragon

One bad feature of the Dragon is that if a key is held down for any length of time, the function *Inkey$* will start to return a null string after a short interval. This can be a nuisance when testing for key presses in games programs etc. but can be overcome by using *Peek* (337) instead.

This will return a value for each key as long as that key is held down, or 255 if no key is being pressed. To find out which values are produced by which keys, enter the program line

```
10 ?peek(337) GOTO 10
```

and make a note of the value produced for each key by pressing different keys down. E.g. "A"=251 , "7"=254 , "8"=253.

Some of the values are duplicated for separate keys, so it may be necessary to use the 8 bytes after 337,e.g. to test for the cursor control keys

↑ gives PEEK (341)=223
↓ gives PEEK (342)=223
← gives PEEK (343)=223
→ gives PEEK (344)=223

As an example of use in a program, instead of

```
10 IF INKEY$="A" THEN GOTO 100
```

use

```
10 IF PEEK (337)=251 THEN GOTO 100
```

Also, *Peek* (135) will return the Ascii value of the last key pressed, even if that key has since been released.

by Bill Clancy

Better than Basic

Can you program in a computer language other than Basic?

Enter this challenging new competition and win a Jupiter Ace.

Basic, for all its advantages, is slow. Programs written in Basic tend to look rather pedestrian when compared to programs written in some other languages such as machine code.
We want something different, something faster than Basic. It could be machine code, Forth, Lisp, Pascal or Fortran. In fact, your entry can be written in anything that is not Basic. And the best non-Basic program, be it game, utility or other, will win the Jupiter Ace.

The entries will be judged by *Popular Computing Weekly* editor, Brendon Gore, and Jupiter Ace designers Richard Altwasser and Steve Vickers. In their selection account will be taken both of the standard of the program and of the accompanying documentation. The whole range of languages and types of program are allowed. The only stipulation is that it must not be written in Basic.

Entries to the award scheme must be accompanied by four of the numbered coupons published in *Popular Computing Weekly* throughout October. The closing date for the competition is November 16. The winning entry will be announced in the issue published on December 23.

Rules

1. *There is no limit on the number of entries you can send in, but each entry must be accompanied by four differently numbered competition coupons.*
2. *Closing date for entries is November 16, 1982.*
3. *The names of the winners will be announced in the December 23 issue of Popular Computing Weekly.*
4. *The Judges' decision is final.*
5. *No employees of Sunshine Publications Ltd, or their families, will be eligible to enter the competition*

Popular Computing Weekly
Better than Basic Competition

Fill in this coupon. When you have collected four differently numbered coupons, send them with your program to: *Popular Computing Weekly*, Better than Basic, Hobhouse Court, 19 Whitcomb Street, London WC2.

NAME: .....

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.....

.....

.....

1

In this slot various contributors explore different aspects of the ZX Spectrum

Plotting the implications of a fast draw

***Malcolm Davison** explains how you can draw ellipses without slowing down.*

If you like writing your own programs, and particularly if they are games programs, the chances are that at some point you will want to draw an ellipse. If you have tried plotting the formula for an ellipse which is:

$$\frac{y^2}{n^2} = 1 - \frac{x^2}{m^2}$$

(where *m* and *n* are half the length of the major and minor axes, respectively) you may have found that it is not quite as straightforward as you would have wished.

If you apply equally stepped values of *x* to evaluate *y*, the ellipse will not be complete, unless the increments are very small and the plotting, as a result, painfully slow. A more satisfactory solution is to first evaluate *y* using increments of *x*, and then evaluate *x* using increments of *y* or:

$$y = \sqrt{n^2 - \frac{n^2x^2}{m^2}} \text{ and } x = \sqrt{m^2 - \frac{m^2y^2}{n^2}}$$

Now if you try the 'ellipse' program you will find the quadrants are plotted separately (see the diagram). The points where the curves meet are determined by setting the *For . . . Next* loops (lines 90 and 130) to values so that there is neither overlap — nor a gap in the curve.

When it comes ■ producing a solid ellipse, simply drawing along the *x* or *y* axes between pairs of points plotted on the ellipse, even if done for both *x* and *y* axes, will still produce a hole in the middle. So in ellipse 2 I have filled the central area as a separate operation, and at the point where the formula has been switched from values of *x* to *y*.

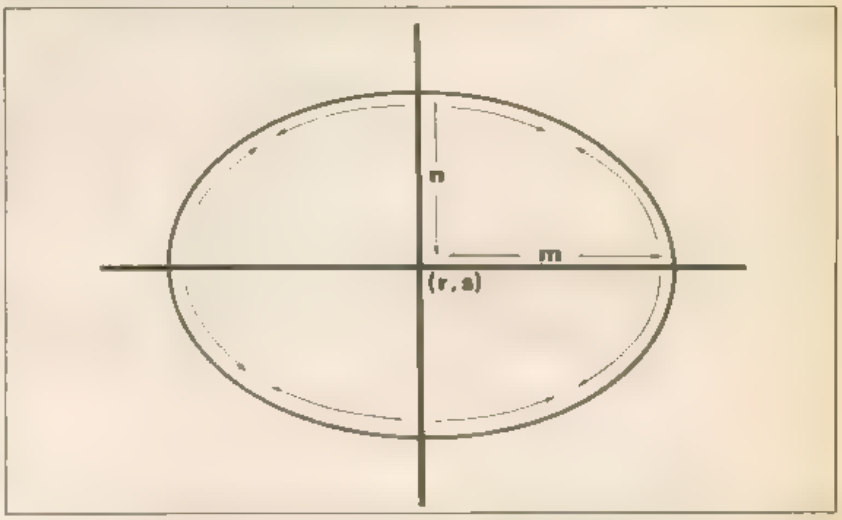
Notice how convenient the *Define Function* feature is when lengthy formulae are used. The use of *Gosub* abd *Return* also help keep the mainline routines simple and allow the subroutines to be re-used elsewhere in your programs.

So now we have drawn a good ellipse, but because of the enormous amount of calculation and the lethargic pace of the Spectrum, it takes 30 or more seconds to complete. This is where 'ellipse 3' comes in — this first draws an ellipse, but then looks within the general confines of the ellipse and line by line notes the location of the circumference of the ellipse in a number array. The program then clears the screen and shows how quickly an ellipse can be drawn when the calculations have already been done (lines 700 — 730).

The program searches for the ellipse in lines 600-655, using the *Point* statement. Actually, it only looks for the top left corner of the ellipse and reconstructs it, assuming symmetry on both axes. Just to show off, I have added lines 750 to 760 so that you can save the array on tape and verify it.

Once you have the array stored on tape, which you can then feed into your program, remember to start the program with a *Goto* statement rather than *Run* (which will cheerfully clear the array you have just loaded). When you *Save* the program the arrays will be stored with it.

Suppose you want to send your program to *Popular Computing Weekly*? Well, the best way to pass this data on in listing form would be ■ store it in a *Data* statement and access it ■ the usual way using *Read*. To help you do this, lines 800 and 801 list the values in the array.



```
  1 REM "ellipse"
 60 DEF FN y(n,m,a)=INT SQR ((n
*2)-((n*2/m*2)*(a*2)))
 70 DEF FN w(n,m,a)=INT SQR (in
*2)-((n*2/m*2)*(a*2)))
 80 LET m=32: LET n=24: LET r=8
5: LET s=87
 90 FOR a=0 TO 30 STEP 1
100 LET y=FN y(n,m,a)
110 GO SUB 400
130 FOR a=14 TO 0 STEP -1
140 LET x=FN w(m,n,a): GO SUB 5
00
150 STOP
400 PLOT r-a,s-y: PLOT a+r,a+y
410 PLOT r-a,s+y: PLOT a+r,s-y
420 NEXT a: RETURN
500 PLOT r-x,s-a: PLOT r+x,s+a
510 PLOT r-x,s+a: PLOT r+x,s-a
520 NEXT a: RETURN
```

```
  1 REM "ellipse2"
  2 PAPER 2: INK 3: BORDER 2: C
LS
 60 DEF FN y(n,m,a)=INT SQR ((n
*2)-((n*2/m*2)*(a*2)))
 70 DEF FN w(n,m,a)=INT SQR (in
*2)-((n*2/m*2)*(a*2)))
 80 LET m=76: LET n=88: LET r=3
7: LET s=87
 90 FOR a=0 TO 54 STEP 1
100 LET y=FN y(n,m,a)
110 GO SUB 400
200 FOR z=1 TO 76
210 PLOT r-a,s+y-2: DRAW 2*a,0
220 NEXT z
240 FOR a=43 TO 0 STEP -1
250 LET x=FN w(m,n,a): GO SUB 5
00
350 STOP
400 PLOT r-a,s-y: DRAW 2*a,0
410 PLOT r-a,s+y: DRAW 2*a,0
420 NEXT a: RETURN
500 PLOT r+x,s-a: DRAW 0,2*a
510 PLOT r-x,s-a: DRAW 0,2*a
520 NEXT a: RETURN
```

```
  1 REM "ellipse3"
  2 PAPER 0: INK 7: BORDER 2: C
LS
 50 REM
 51 REM ********************
 52 REM  Use ellipse function
 53 REM   to draw an ellipse
 54 REM ********************
 55 REM
 60 DEF FN y(n,m,a)=INT SQR ((n
*2)-((n*2/m*2)*(a*2)))
 70 DEF FN w(n,m,a)=INT SQR ((n
*2)-((n*2/m*2)*(a*2)))
 80 LET m=32: LET n=24: LET r=1
27: LET s=87
 90 FOR a=0 TO 90 STEP 1
100 LET y=FN y(n,m,a)
110 GO SUB 400
200 FOR z=1 TO 35
210 PLOT r-a,s+y-1: DRAW 2*a,0
220 NEXT z
240 FOR a=90 TO 0 STEP -1
250 LET x=FN w(m,n,a): GO SUB 5
00
350 GO TO 600
400 PLOT r-a,s-y: DRAW 2*a,0
410 PLOT r-a,s+y: DRAW 2*a,0
420 NEXT a: RETURN
500 PLOT r+x,s-a: DRAW 0,2*a
510 PLOT r-x,s-a: DRAW 0,2*a
520 NEXT a: RETURN
580 REM
590 REM ********************
591 REM  Store x co-ordinates
592 REM   in the z() array
594 REM ********************
595 REM
600 DIM z(87)
610 FOR b=1 TO n
620 FOR a=(r-8) TO r
630 IF POINT (a,s+n-b)=1 THEN G
O TO 650
640 NEXT b
650 LET z(b)=a
655 NEXT b
660 CLS
690 REM
691 REM ********************
692 REM  Draw the ellipse
693 REM   using the array
694 REM ********************
700 FOR a=1 TO n
710 PLOT z(a),(n+s)-a: DRAW (r-
z(a))*2,0
720 PLOT z(a),(s-n+a): DRAW (r-
z(a))*2,0
730 NEXT a
731 REM
732 REM ********************
733 REM  Save the array on tape
734 REM ********************
735 REM
750 SAVE "ellipse" DATA z()
755 PRINT "save now complete-re
wind tape - press play to verify
"
760 VERIFY "ellipse" DATA z()
800 FOR a=1 TO n: PRINT z(a)
801 NEXT a
```

Boxing clever for the court in 30 bytes

John Durst presents a program for drawing boxes on your ZX81.

Many games played on a computer take place on some kind of "court"; many programs can be enhanced if results are displayed on a nicely divided format. Writing these "boxes" into a program in the normal way can use up a lot of memory. To hold a full screen in a program uses nearly 700 bytes — a lot to sacrifice, even when you do have the full 16K.

But here is a program, in machine code, which will let you draw pretty well any box shape you want in just 49 bytes. You can easily get it into 1K. You will have to supply it with data — but even quite a complicated box will only use another 20 or 30 bytes.

The idea is quite straightforward, but you have to know and understand the rules. I will try and make them as simple and clear as possible.

First, the operating program itself. This is placed in a Rem statement in line 1 of your program (I am assuming that you have at least a rough idea of machine code programming). Fig 1 shows how to enter the machine code. The actual program is in line 10, in hexadecimal. Line 1 is set up with exactly 49 figures (the actual figures do not matter, but I find it convenient to enter them a line at a time — that way I know I've got exactly 32 bytes for each digit).

If you enter the program exactly as shown in Fig 1 and then *Run* it, you should get Fig 2. Line 1 will change into gobbledegook, but do not worry — it is still only using 49 bytes.

Now you can scrap line 10, which has done its job, and get it ready for a new lot of data. You should also change the address in line 40, as you want. *Poke* the data to line 2 of your program. Finally, you must set up a new Rem statement in line 2, as a home for the data we have talked about. I suggest a full line of "1"s (32 in all).

Before I explain how to code the data, why not type in line 10 in Fig 3, just to convince yourself that it works. Type in lines 100 and 110 too — and then *Run* 10.

Now the mystery formula for entering the data. The code works like this: A byte is expressed in hex notation as two hex digits (0 through F). The code uses the first hex digit to show how many times you want a character repeated, ie if you want a line of 10 characters, you would enter it as "A". The second hex digit gives the character to be printed in that line, as shown in Fig 4, "Normal line".

So, if you want to rule a line 10 characters long you enter "A3" (you'll find that in positions 5 and 6 in line 10 of Fig 3). "A0" gives 10 blanks and "17" gives a right-handed corner — you will find them at the start of line 10.

Now comes the clever bit. When you want to end a line, you use the hex digits from 8 to F, in the second position of the byte. This will give an inverse video character, as shown in Fig 4, and signals the program to start a new line.

The first digit you enter in this byte gets a different job, as well. Instead of determining how many times the character is repeated, it signals how many times the next line is to be repeated. In line 10 of the program, you will find "3C" — character "C" (the left-handed corner) for the end of the line and "3", to give 3 blank lines with vertical edges (the upper part of the box). This line is coded as "A0 15 A0 1D".

The "1", in "1D", means the next line (the line of dots) will only appear once. If it were "2D", it would be printed twice. You probably realise that the opening "A0" in each line is there to displace the figure into the centre of the screen.

One final thing: the last two digits of data must be "00". This tells the program to stop. Also, the top line of any box (the first line of data) will only be printed once. This is set up in the program and you cannot change it easily.

Once you get the hang of it, you will find this little program can be very versatile. Fig 5b is derived from Fig 5a by changing just a couple of values. I reckon you could set out a complete tennis court in 36 bytes of data.

This program is particularly pleasing for computer buffs who are really into machine code. It gives them the chance to use instruction RRD (ED67) — rotate right decimal — which must be the fanciest in the instruction set, but hard to find a use for.

Fig 1

```
  1 REM 111111111111111111111111
111111111111111111111111
  10 LET A$="0E0111B940212140D51
A773E00BE2002D1C9ED67CB5F2007460
710FD1310EAEE86D73E7600D70D2003D
1160C4E13E11A04"
  20 FOR J=1 TO LEN A$/2
  30 LET X=J+2
  40 POKE 16513+J,CODE A$(X-1)*1
6+CODE A$(X)-476
  50 NEXT J
```

Fig 2

```
  1 REM  "▪▪RND66RND$TR$ ,"Y ▪▪A
"SGN TAN GOSUB "ACS "74▪"?NOT " CL
EAR  "  REM INPUT ▪NOT "Y
 215 "SGN "1"?" LPRINT "USR
  10 LET A$="0E0111B940212140D51
A773E00BE2002D1C9ED67CB5F2007460
710FD1310EAEE86D73E7600D70D2003D
1160C4E13E11A04"
  20 FOR J=1 TO LEN A$/2
  30 LET X=J+2
  40 POKE 16513+J,CODE A$(X-1)*1
6+CODE A$(X)-476
  50 NEXT J
```

Fig 3

```
  1 REM  "▪▪RND66RND$TR$ ,"Y ▪▪A
"SGN TAN GOSUB "ACS "74▪"?NOT " CL
EAR  "  REM INPUT ▪NOT "Y
 215 "SGN "1"?" LPRINT "USR
  2 REM 111111111111111111111111
11111111
  10 LET A$="A017A33CA815A01DA01
5A13CA815A01DA0A32300"
  20 FOR J=1 TO LEN A$/2
  30 LET X=J+2
  40 POKE 16568+J,CODE A$(X-1)*1
6+CODE A$(X)-476
  50 NEXT J
 100 PRINT AT 7,8;
 110 RAND USR 16514
```

CODING FOR BOX

NORMAL LINE		END LINE	
0	□	8	■
1	▗	9	▟
2	▄	A	▙
3	▖	B	▌
4	▚	C	▛
5	▐	D	▜
6	▀	E	▞
7	▘	F	•

Fig 4

Fig 5a

Fig 5b

Machine Code

Ian Stewart and Robin Jones present a new series for beginners

Mneme and the micros

What can be held in a memory word? Well, any pattern of 16 bits, but those 16 bits can mean anything we want them to mean. If we want them to mean a 2's complement coded integer, then a word holds a number in the range — 32768 to 32767. If we want them to mean a positive integer with no sign bit then the number is in the range 0 to 65535. If we want, we can split the word into two 8-bit fields, each of which represents an alphabetic, punctuation or graphics symbol. As Tweedledee (or was it Tweedledum?) said: "When *I* use a word, it means just what I choose it to mean — neither more nor less." Perhaps Lewis Carroll was ahead of his time.

Now for the special-purpose A-register. This is used every time you do any arithmetic. The result of any sum you ask the machine to do is put into the A-register (sometimes it's called the *accumulator*). Most arithmetic operations work on two values — it's no good asking the machine to work out 3+, you need to say what 3 is to be added to. One of these values must be in the A-register before the addition operation is executed. So you can write an instruction such as:

```
ADD (1A3)
```

and the machine takes that to mean:

1) Add the contents of memory location 1A3 to the contents of the A-register (the brackets round 1A3 indicate that it is the *contents* of 1A3 and not the *number* 01A3 which is to be added).
2) Put the result back in the A-register.

We have just written our first machine level instruction. It's not actually in machine code, but it's close. Look at its general form. It consists of an operation code. *Add* and an address (1A3). Many instructions will look like that.

Incidentally, life is too short to say "operation code" too often. Everybody shortens it to *opcode*.

An addition program

Let's think about a sequence of machine instructions which would model the Basic statement:

```
LET R = B + C
```

First we would have to assign actual addresses to *R*, *B* and *C*. Suppose that these are 103, 104 and 105, respectively. We have to get the contents of 104 into the A-register. Let's invent an *LD* (load accumulator) instruction to do this:

```
LD (104)
```

and add the contents of 105

```
ADD (105)
```

and finally we need a way of storing the A-register's contents back in 103. So we'll invent a "store" instruction:

```
ST (103)
```

Now we have a simple machine level program consisting of 3 instructions:

```
LD (104)      [load B into A-register]
ADD (105)     [add on C]
ST (103)      [put the result in R]
```

How do we get the machine to run such a program? We are used to the idea that a program is stored in the machine *before* it's executed. After all, if you wrote the Basic statement

```
10 PRINT "HELLO WORLD"
```

you'd be somewhat disconcerted if, as soon as you hit *Newline*, the message "HELLO WORLD" were displayed. You expect it to be held until you need it. So, by the same token, a machine level program has to be stored first. Where more natural to store an instruction than in a memory word (a word means what you want it to mean — remember)? Of course, that implies that the opcodes *Ld*, *Add* and so on have to be coded as bit patterns, but all we have to do is invent a table of bit patterns in a quite arbitrary way like this:

Opcode mnemonic	Binary code
ADD	0000
LD	0001
ST	0010

and every time we think of a new opcode that's needed, we add it to the table.

This assumes that all opcodes have a 4-bit binary code. That allows 16 different patterns and therefore 16 distinct instructions. This is a small instruction set by modern standards but it will do for our hypothetical toy computer. We've got 16 bits in the word altogether, so 12 are left for the address portion of the instruction.

So *Ld* (104), once inside the machine looks like:

```
0001        000100000100
opcode      address (104 hex converted to binary)
```

Once you've seen one bit pattern, you've seen them all. From now on we'll write the hex versions of instructions. It's marginally less tedious.

Suppose we store our 3-instruction program from location 0FF onwards

Now we need a way of saying to the machine: "Kick things off by executing the instruction in 0FF, then do the one in 100, then one in 101." That's what the PC-register, or *program counter*, is for. It acts as a kind of bookmark for the computer. We run the program in initialising the PC to the address of the first instruction. While the machine is obeying this instruction, the PC is automatically updated by 1, so that when the system returns to examine the PC, it will go and obey the next instruction, and so on.

There's a snag, though. While the last instruction (in 101) is being dealt with, the PC will be updated by 1 as usual, and so when the machine looks at it again, it will find 102, and leap off to execute the instruction there. What instruction? We didn't put one in 102. Ah! But there has to be a bit pattern in 102 left by a previous program, or just set up when the machine was switched on. So the machine will interpret this pattern as if it is an instruction, because that's what we've asked it to do. And then it will roll on through locations 103, 104 and 105 and that's where we're storing data. So if the number in 104 is 20FF, for instance, the machine will interpret this as:

```
ST (0FF)
```

which will copy the contents of the A-register into 0FF, thereby destroying the first instruction of our program! Obviously what we need is a "halt" instruction (we will use the mnemonic *HLT*) which stops the updating of the PC in its tracks. So the program now reads:

```
LD (104)
ADD (105)
ST (103)
HLT
```

There's an important point to remember here. Precisely because we are using words to mean different things at different times, we have to keep a very careful eye on the implications the machine will draw from what we tell it to do. If we request it to *ADD* the contents of a location to the A-register, then it will assume that that location holds a number. It will make no tests; it cannot — any bit-pattern could represent a number. Similarly, any bit-pattern could represent an instruction, so if the PC points to a location, its contents will be executed as an instruction.

The rule is: *keep data and programs firmly apart.* If you don't, you can expect to be totally mystified at regular intervals. A whole program can disappear without trace while it is running.

To be continued next week

If you have any machine code subroutines/tips/games, please send them to: Machine Code, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer.

BINATONE WE KNOW NOT

Barry Keating of Harlow, Essex, writes:

Q After reading your news item about the Binatone (*Popular Computing Weekly*, July 15), I decided to wait for it. But, recently neither you nor anyone else has carried any information on the Binatone for some time. Do you know when it is going to come out? Failing this, have you any details on the Oric 1? Is it worth waiting, or should I go ahead and order a computer that is already on the market, such as the new Commodore 64, or ZX Spectrum?

A My advice is to go ahead and look for a computer that is available now. We have tried to follow up the Binatone story, but we have no new information. The only two new micros liable to appear in the next few weeks are the Jupiter Ace and the Lynx. Both these machines were at the Barbican show, September 9-12.

WAITING, WAITING

James Knights of Badger Bank, Ipswich, Suffolk, writes:

Q I have been waiting for my Spectrum for many months and I am now very frustrated. I have been thinking about getting another computer and have been looking around for one. I am quite interested in buying an Atari 400, and I wonder if you could answer a few questions about it for me.

Does it have a *Verify* command, does it have a flashing ability and how many colours can it display at once? Also, the Spectrum leaflet says that you cannot define your own graphics. Is this true?

A If you want a computer which is geared to playing games, then the Atari is a computer to consider. But, keep in mind the cost of Atari cartridges.

I would also check if you can get your money back from Sinclair. You might find that after all this time it is going to be quicker to get your Spectrum, rather than cancelling your order and reclaiming your money. It does seem at last as if some of the large backlog of orders is being cleared.

The Atari does not have a *Verify* command, nor a flashing ability. It can only display five colours, and does not have a user defined graphics function as such. To go some way towards compensating for these defects, the Atari has a higher resolution than the Spectrum and much better sound. Each of the colours has a 'luminance', which is essentially a Bright/Dim level that has 15 different variations.

User defined graphics are also possible, either by using a *Poke* command or else by using a character set generator module (16K) with a joystick.

NO VINTAGE PROBLEM

H Marsland of Broomfield Close, Chelford, Macclesfield, Cheshire, writes:

Q I have just bought a ZX81 and, though I have two degrees (1935 vintage), I am finding the manual difficult to understand. I am now at the stage where I can *Save* a program onto tape, and then get it to go back on to the computer.

Today I bought *Popular Computing Weekly* and found it full of discussion on the ZX Spectrum. I wondered if you had any further details, and whether or not you think it advisable to buy one.

A Do not worry about not understanding the ZX manual. Many people who have degrees of far more recent vintage than yours have found difficulty with the manual. The books I usually advise to help out are *Getting Acquainted with your ZX81* by Tim Hartnell, from Interface, 44-46 Earls Court Road, London W8 and *Byteing Deeper into your ZX81* by Mark Harrison, from Sigma Press, Alton Road, Wilmslow, Cheshire SK9.

If you have read further issues of *Popular Computing Weekly*, you will probably have gained an idea as to what this latest Sinclair computer can do. As to whether or not you think that you should buy one, my advice is to wait until you have a good understanding of your ZX81. A Spectrum can do everything a ZX81 can do, and a lot more besides.

LINKUP EARMIC

David Heath of Bagley Close, Kennington, Oxford, writes:

Q I am wondering if it is possible to link two ZX81s together via the Ear and Mic sockets? Then programs could be played from one computer to another, without having to *Save* and *Load* cassettes. I would be very grateful if you could give me any advice.

A It is worth trying, but I cannot tell you what would happen as I do not know of this being tried. However, it could not be done directly, because of the signal levels of the Mic and Ear sockets.

I would suggest that you put the computer with the program, into *Save* mode, so the signal is going down the Mic lead. The output of this socket is very low, so a small amplifier would be needed to boost the signal up to the 4-6 volts required by the Ear socket.

Next, put the computer that is receiving the program into *Load* mode. This is the only way that I could see you succeeding. If you try it, please let me know the results, whatever the outcome.

While on this subject, *J R Patterson of Pembroke Avenue, Great Yarmouth*, wants to know if a ZX81 can be used with his Sony TC 630 reel to reel tape recorder. And *Robert Fender of Castle Lea, Newport, Gwent*, wants to know about using the Spectrum with his Phillips N2210 which has Din standard plugs.

In both cases it is a matter of checking the output of the sockets, which must be 4-6 volts. If the reel to reel runs directly off the mains and does not have a transformer then it will probably output at 240 volts, which will not do your 4-6 volt computer input a lot of good.

Din standard plugs on the other hand tend to work on a very low output, usually less than two volts. This would be insufficient and, as mentioned earlier, some sort of amplifier would be needed.

I'VE FINISHED WAITING

Jane Kennedy of Newton Mearns, Glasgow, writes:

Q I have just got my BBC micro, after weeks and weeks of waiting, and I think that it will be worth the delay. I have been told by someone that it is possible to specify your own modes on the BBC computer. Is this correct? If so, can you give me a listing, or a book, that will explain it to me?

A It is possible to specify your own modes by altering register six of the 6845 chip. This is the register that sets up the number of character rows in a frame. It can have a value from 0 to 127, though there are some important limitations which can lead to parts of the line being displayed off the screen, or lines being repeated. The book that deals with this subject in detail is *The BBC Micro revealed* by Jeremy Ruston, available from Interface publications.

ONE BITE OF AN APPLE

Simon Harriss of Greencroft, Brampton, Cumbria, writes:

Q I have had considerable experience on the Apple II micro. I have recently bought a BBC micro and would like to think that I have got to grips with it. One thing still puzzles me. Can you tell me, simply, how to save and record data on cassette file? I cannot make sense of the provisional user guide instructions.

A By now you should have your guide. I have not seen it yet, but I hope it is clearer than the provisional guide.

You open a file with:

```
A=OPEN OUT ("name")
```

where A is the variable, and *Open out* can be replaced with *Open in*. This is then followed by:

```
PRINT #A, data
```

or

```
INPUT #A, data
```

The file must be closed with

```
CLOSE #0
```

Classified

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ZX81 16K plus software and workcard £110 ono. Oswestry (0691) 4635 evenings.

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ZX81 PROGRAMMERS' exchange "Basic Tricks" and program. See - 10p stamp. Nick Godwin, 4 Hurkur Crescent, Eyemouth, Berwickshire.

ACORN ATOM 12K + 12K 4K ROM Toolkit, tapes, books, £175. Also O.U. Hektor with units £100. 232 Kingsway, Burnage, Manchester 19.

2K RAM ZX81. 8 games £5. 2K RAM upgrade £6.50. Mr T. Webb, 194 Hagdan Lane, Watford, Herts.

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VIC20, cassette, 3K Ram pack, Joystick, software, etc, excellent condition. £220. Hastings 440150 after 5 pm.

ZX81 16K SOFTWARE five games-machines code: Meteor and 'Death Star' (includes MC list write). Basic games: Snake, 'Maze and 'Dragon Maze only £4.95 from M. Sudworth, 17A Crowell Road, Oxford.

ZX81 VIDEO INVERTER. Saves your eyes, increases safe level displays sharp white characters on solid black background screen. Kit £4, built £5 (includes VAT and P&P, instructions). Reviewed in Popular Computing Weekly, August 26. Send cheque postal order to D. Finch, 6 Stanton Road, Thelwall, Warrington, Cheshire WA4 2HS.

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VIC20 COLOUR COMPUTER. 20K RAM, hi-res graphics ROM, RS232 interface. Cassette player, joystick, manuals and software, £250. Kidderminster 515285.

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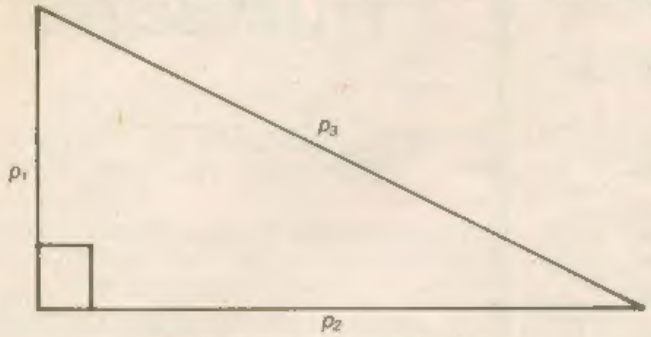
Primordial thinking

by Gordon Lee

The last of these columns looked at prime numbers, leaving you with the proof of why it is impossible for a right-angled triangle to have all three sides both integers and prime.



By Pythagoras' theorem, p_1^2 plus p_2^2 equals p_3^2. Apart from 2 (the lowest prime), all primes are odd, so both p_2 and p_3 (the two larger sides of the triangle) must be odd. The square of any odd number is also odd, so p_1 must be even since the sum of two odd numbers is always even. Therefore, p_1 must be 2. But from Pythagoras p_2 and p_3 must have squares that have a difference of 4 and a quick examination of a table of squares shows that such a triangle is impossible. If p_1 equals p_2, irrespective of whether they are both odd or even, the sum of their squares, and so p_3, is even. This also cannot be.

Primes are difficult to identify and it is not surprising that, for centuries, mathematicians have tried to find a simple formula to generate them. The French mathematician Fermat believed in 1640 that he had succeeded with the formula:

$2^{2^n} + 1$ = prime

These Fermat numbers progressed as follows:

$n = 0 \quad 2^{2^0} + 1 = 2^1 + 1 = 3$
$n = 1 \quad 2^{2^1} + 1 = 2^2 + 1 = 5$
$n = 2 \quad 2^{2^2} + 1 = 2^4 + 1 = 17$
$n = 3 \quad 2^{2^3} + 1 = 2^8 + 1 = 257$

Unfortunately, the sixth Fermat number, 4,294,967,297, is not prime. Its factors 641 and 6,700,417 were not identified for over a hundred years, so Fermat died not knowing that his formula had failed.

There is no limit to the number of primes. No matter how high we go, there will always be a higher prime. The proof is quite simple. Multiply together all known primes up to a certain value, say N. Add one to the total. This number, $N + 1$, is either a prime or a composite number with one prime factor larger than N.

In 1978 two American teenagers reported that $2^{21701} - 1$ is a prime. This number, with 6533 digits, is thought to be the largest known prime.

Puzzle No. 25

There are 168 primes between 0 and 1000. Between 1000 and 2000 there are considerably fewer. As is often the case with primes, there is however no recognisable pattern.

How many primes are there under 10,000? Present the results in the form of a table listing the number of primes in each successive range of 1000 integers — 0 to 1000, 1000 to 2000 and so on.

Solution to Puzzle No 21

In the program to find the solution the cards are assigned an order from 1 to 52 in the Dim statement $A(M)$. Lines 80 and 90 simulate the rearrangement of the cards during one shuffle — and the new order is lodged in the dimensioned B array. This is then transferred back to A (Lines 120 to 140). When card N corresponds to $A(N)$ then the cards will be back in order (Line 160). S keeps a record of the number of shuffles.

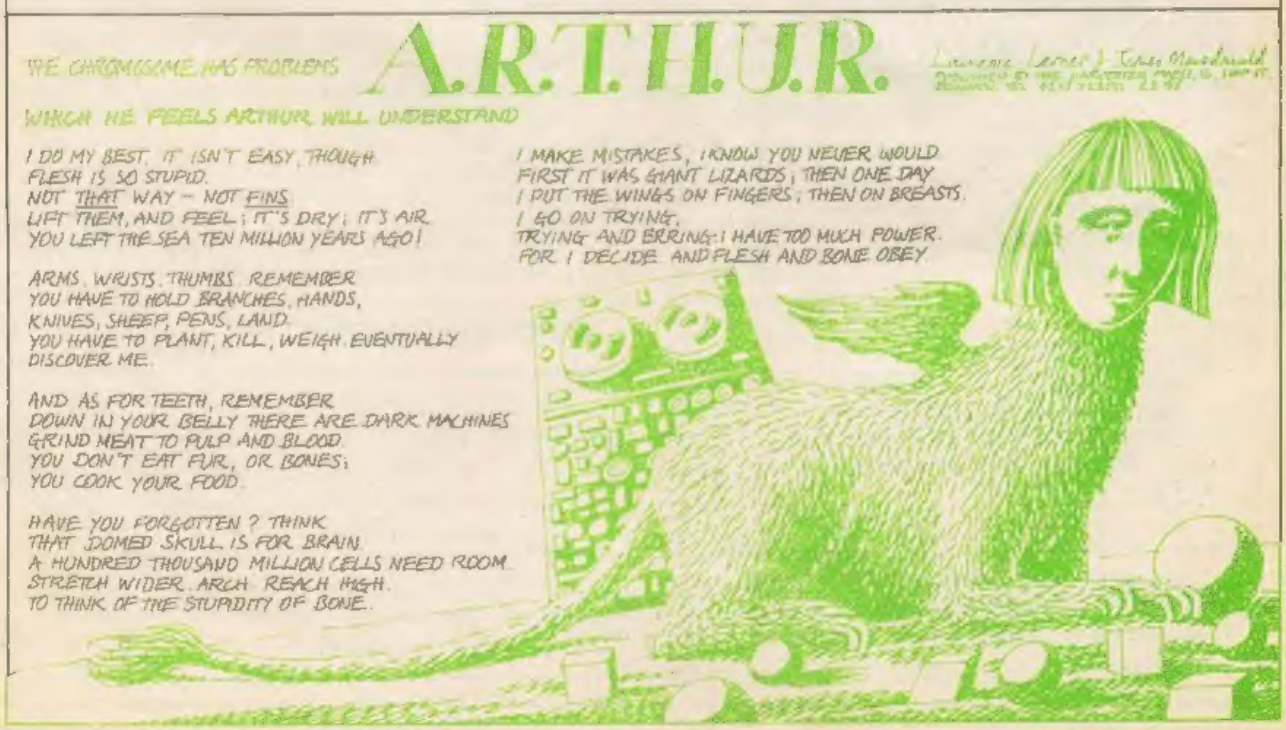
```
10 LET S = 0
20 DIM A(52)
30 DIM B (52)
40 FOR N = 1 TO 52
50 LET A (N) = N
60 NEXT N
70 FOR N = 1 TO 52 STEP 2
80 LET B (N-1) = A(26 +(N/2))
90 LET B (N) = A(N/2)
100 NEXT N
110 LET S = S + 1
120 FOR N = 1 TO 52
130 LET A (N) = B(N)
140 NEXT N
150 FOR N = 1 TO 52
160 IF A (N)<> N THEN GOTO 70
170 NEXT N
180 PRINT "NUMBER OF SHUFFLES IS "; S
```

For a pack of 54 cards all values of 52 in the program are changed to 54, and the value 26 (in Line 80) is increased to 27.

Using the program it takes 52 shuffles to restore a pack of 52 cards to its original order and, strangely, only 20 shuffles are needed to restore a pack of 54 cards.

Winner of Puzzle No 21

The winner is: Dave Woolcock, Bank Place, Ashton, Preston, who receives £10.



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